

QUESTION BANK
FOR SELECTION TO THE POST OF
JUNIOR ENGINEER (Non - AC)
GRADE - II IN PB : Rs. 9300 - Rs. 34800
WITH GRADE PAY Rs. 4200/-
AGAINST PROMOTIONAL QUOTA IN
ELECTRICAL (GS) DEPARTMENT ON
SC DIVISION

1st APRIL-2015

Sr. DEE/M/SC

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**QUESTION BANK FOR SELECTION TO THE POST OF JUNIOR ENGINEER (Non -AC)
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RANKERS QUOTA IN ELECTRICAL (GS) DEPARTMENT ON SC DIVISION.**

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Part – A (TRAIN LIGHTING)**I. SELECT THE CORRECT ANSWER:**

- 1) In regulator how many windings are available in Magnetic amplifier (a & c)
 - a. 6
 - b. 3
 - c. 4
 - d. 5
- 2) Size of V belts used 4.5KW Alternator (c)
 - a. C121
 - b. C123
 - c. C122
 - d. C124
- 3) Capacity of battery fuse in TL Coaches (a)
 - a. 35 A (HRC)
 - b. 63 A (HRC)
 - c. 16 A (HRC)
 - d. 5 A (HRC)
- 4) The gap between the two halves of axle pulley should be (c)
 - a. 0.5 – 1.0 mm
 - b. 2.0 – 3.0 mm
 - c. 3.0 – 4.0 mm
 - d. 5.0 – 5.5 mm
- 5) What are the AH capacity of cells used in TL coaches (c)
 - a. 110
 - b. 1100
 - c. 120
 - d. 800
- 6) Name the Acid used in lead acid cells (a)
 - a. Sulphuric Acid
 - b. Hydrochloric Acid
 - c. Nitric acid
 - d. Phosphoric Acid
- 7) Give the Spg & Voltage of Fully charged cells (a)
 - a. 1220 & 2.2
 - b. 1220 & 2.1
 - a. 1200 & 2.2
 - b. 1200 & 2.1
- 8) Cut in speed for B/L alternator in TL application (c)
 - a. 21
 - b. 20
 - c. 19
 - d. 18
- 9) Inverter converts (a)
 - a. DC to AC
 - b. DC to DC
 - c. AC to AC
 - d. AC to DC
- 10) IGBT are used as (a)
 - a. High frequency switching device
 - b. Illuminating device
 - c. Low frequency switching device
 - d. Amplifier
- 11) Boost charge of VRLA cells (a)
 - a. 2.3 V/Cell
 - b. 110 V/Cell
 - c. 2.25 V/Cell
 - d. 115 V/Cell
- 12) Trickle charging of VRLA cell (c)
 - a. 2.3 V/Cell
 - b. 110 V/Cell
 - c. 2.25 V/Cell
 - d. 115 V/Cell
- 13) No of MA's in 4.5 KW regulators (a)
 - a. 1
 - b. 3
 - c. 2
 - d. 4
- 14) No of ET in 4.5 KW regulators (a)
 - a. 1
 - b. 3
 - c. 2
 - d. 4
- 15) Rectifier converts (b)

- | | | | |
|-----|--|------------------------------------|--|
| | a. DC to AC | c. AC to AC | |
| | b. AC to DC | d. DC to DC | |
| 16) | Give the half load setting of R/R for TL application | (a) | |
| | a. 19 Amps | c. 21 Amps | |
| | b. 20 Amps | d. 22 Amps | |
| 17) | Required level of Illumination for Ordinary sleeper coach | (c) | |
| | a. 14 Lux | c. 20 Lux | |
| | b. 22 Lux | d. 16 Lux | |
| 18) | Give the tension length of spring used in Tension rod of 4.5 KW Alternator | (a) | |
| | a. 310 mm | c. 269 mm | |
| | b. 265 mm | d. 275 mm | |
| 19) | Why lead acid cells are called as Secondary cells | (c) | |
| | a. Since it can't be recharge | c. Since it can be recharge | |
| | b. Since it can't charge initially | d. None | |
| 20) | Name the method to be used to find out Earth leakage | (a) | |
| | a. Double test lamp method | c. Tong tester method | |
| | b. Multi meter method | d. Volt meter method | |
| 21) | Voltage setting in VRLA cells for Express & passenger trains is | (c) | |
| | a. $128 \pm 0.5V$ & $127 \pm 0.5V$ | c. $127 \pm 0.5V$ & $128 \pm 0.5V$ | |
| | b. $125 \pm 0.5V$ & $125 \pm 0.5V$ | d. $124 \pm 0.5V$ & $122 \pm 0.5V$ | |
| 22) | If alternator is not generating voltage, the reason would be | (d) | |
| | a. Field may be open | c. Dropping of V-belts | |
| | b. Fuse in regulator had blown | d. All the above | |
| 23) | The size of bus bars recommended to use in 4.5KW ERRU is | (b) | |
| | a. 90 Sq. mm | c. 50 Sq. mm | |
| | b. 16 Sq. mm | d. None | |
| 24) | Terminals of IGBT are | (b) | |
| | a. Base, emitter, collector | c. Gate, source, drain | |
| | b. Gate, emitter, collector | d. None | |
| 25) | No. of zeners connected across the primary of the step down transformer of power module. | (a) | |
| | a. 4 | c. 2 | |
| | b. 3 | d. 1 | |

II. WRITE DOWN THE ABBREVIATIONS:

- | | | |
|---|--------|--------------------------------------|
| 1 | PWM | : Pulse Width Modulation. |
| 2 | VRLA | : Valve Regulated Lead Acid |
| 3 | IGBT | : Insulated Gate Bi polar Transistor |
| 4 | FRPCPY | : Failure Rate Percentage Per Year. |
| 5 | BTU | : British Thermal Unit. |
| 6 | IOD | : Injured On Duty. |
| 7 | LAP | : Leave at Average Pay |

8	LHAP	: Leave at Half Average Pay
9	CL	: Casual Leave
10	PNM	: Permanent Negotiable Machinery
11	AIRF	: All India Railway men federation.
12	NFIR	: National Federation of Indian railways.
13	DA	: Dearness allowance
14	TA	: Traveling allowance or transportation allowance
15	LWP	: Leave without pay
16	CCA	: City compensatory allowance.
17	PATB	: Passenger alarm terminal board
18	EFT	: Emergency feeding terminals
19	PELE	: Portable emergency lighting equipment
20	IRIEEN	: Indian railways institute of electrical engineers
21	PERT	: Programme evaluation & review techniques
22	DGS&D	: Director General of supply and Disposal
23	EMD	: Earnest Money Deposit
24	SD	: Security Deposit
25	BG	: Bank Guarantee
26	PG	: Performance Guarantee
27	CRI	: Colour rendering Index
28	D&G charges	: Direction & General charges
29	PPCP	: Poly Propylene Co-polymer
30	EEPROM	: Electrically Erasable Programmable Read Only Memory

III. FILL IN THE BLANKS:

- 1) The process of removing heat from low temperature level and rejecting at high temperature is called. **REFRIGERATION.**
- 2) Any substances for change of its state at constant temperature absorbs/give up heat is called **LATENT HEAT.**
- 3) The sum of sensible heat and latent heat of substance in process is called **ENTHALPY.**
- 4) The latent heat of fusing ice is **144 BTU/LB.**
- 5) The unit of refrigeration is **TON OF REFREGIRATION – 12000 Btu/Hr or 3023.98 K.Cal/Hr.**
- 6) The temperature measured by ordinary thermometer is called **SENSIBLE HEAT.**
- 7) What is the boiling point of water **100 °C.**
- 8) AT what temperature water starts freezing_ **0 °C.**
- 9) One watt is **3.412 BTU.**

- 10) One BTU is 0.252 K.calaries.
- 11) The unit of heat is BTU OR K.CAL
- 12) RMPU means ROOF MOUNTED PACKAGE UNIT
- 13) The setting of HP cutout in RMPU coaches is 415 psi.
- 14) The setting of LP cutout in under slung coaches is 35 psi.
- 15) The boiling point of refrigerant R22 -40.8 °C.
- 16) The boiling point of refrigerant R12. - 29.8 °C.
- 17) Artificial respiration is required to the person met with electrical accident.
- 18) The rating of alternator in TL coaches is 4.5 KW.
- 19) The latent heat of evaporation IS THE HEAT REQUIRED TO CHANGE THE LIQUID INTO VAPOUR.
- 20) The temperature maintained in the refrigerator is LESS then 0 °C.
- 21) The dry bulb and wet bulb temperatures equals then the RH is 100%
- 22) The moisture absorption in refrigeration circuit is done by DEHYDRATOR CUM FILTER.
- 23) The commonly used refrigerants are R 12 & R 22
- 24) The lubrication of system in the sealed compressors is done by FREEZOL
- 25) The 3-phase voltage unbalance in supply should not exceed 2.5. % To 5%
- 26) For maintaining power supply quality the rate of change of frequency should not exceed. 1 HZ/Sec.
- 27) The voltage of 11 KV supply is 11000V
- 28) Tender Notice is to be published for. Open tender
- 29) Copper is the good conductor of electricity.
- 30) Completion estimate is not required for calling tender.
- 31) Contingencies charges mean Transportation charges.
- 32) Detailed estimate is to be prepared for sanctioned works.
- 33) Detailed estimate needs sanction of HOD.
- 34) The fire extinguisher used for Electrical fire is CO2
- 35) Fire is the combination of material and temperature & Oxygen.
- 36) B Type of fire extinguisher used to nullify the oil fires.
- 37) Electric type of fire is clarified as D type.
- 38) CO2 type fire extinguisher is used for electrical fires.
- 39) Ordinary fire can be extinguished by water.
- 40) RUBBER HAND GLOVES are to be used while operating isolator handle in substations.
- 41) Ordinary fire can be extinguished by WATER OR SAND.
- 42) Artificial respiration is required to the person met with ELECTRICAL accident.
- 43) What is IOD? INJURED ON DUTY
- 44) What is meant by fatal accident? THE ACCIDENT CAUSES WITH LOSS OF HUMAN LIFE
- 45) If a man touches a live wire, he gets SHOCK. /electrocuted.
- 46) CTC type extinguisher is used for ELECTRICAL fire.
- 47) If a transformer catches fire FOAM type of fire.
- 48) The fire extinguisher used for Electrical fire is CO2 TYPE.
- 49) Fire is the combination of Material, temperature and oxygen
- 50) B type of fire extinguisher used to nullify the oil fires.
- 51) Electric type of fire is clarified as D type.
- 52) CO2 type fire extinguisher is used for ELECTRICAL fires.
- 53) Soda ash type fire extinguisher is used for GENERAL fires.
- 54) CTC OR FOAM type of fire extinguishers will be used to extinguisher chemical fires.
- 55) The system voltage in TL coaches is 110 V DC supply.

- 56) **Monoblock** type & **120 Ah** capacity of batteries are used in TL coaches.
- 57) The codal life of lead acid batteries is **04** years.
- 58) The codal life of VRLA batteries is **04** years.
- 59) The **35 SWG** size of fuse wire is used for each fan or light in distribution fuse board.
- 60) The voltage setting of 4.5 KW alternator at regulator is **123 ± 0.5** volts.
- 61) If a cell is found less than **1.7 volts**, it is considered as defective.
- 62) The wattage of 400 mm DC fan in TL coach is **35 watts**.
- 63) The specific gravity of sulphuric acid which is used to make as electrolyte is **1.835**.
- 64) The working voltage of 20W/TL inverter is **110 volts DC**.
- 65) **16A** HRC fuse is used for L1, L2 & fan circuit in RJB of TL coaches.
- 66) **100 KVA** inverter capacity is used for cell phone charger in TL coaches.
- 67) The gap between wheel edge to axle pulley edge is **$145\text{mm} \pm 3\text{mm}$** .
- 68) The gap between the mounting bracket to adjustment nut of tension device for 4.5 KW alternator is **75mm**.
- 69) Earht fault can be detected by using **double test lamp** or **multi-meter**.
- 70) The capacity of alternator, batteries & fans in TL coach are **4.5KW, 120Ah & 35W**.

IV. INDICATE TRUE OR FALSE TO THE FOLLOWING:

- 1) Without EMD the tender offer is valid. **False**
- 2) Amps is the unit of current **True**
- 3) Tinned copper conductor of 14SWG is used as earth continuity wire in the
- 4) Internal Wiring system. **True**
- 5) Wood is the bad conductor of electricity. **True**
- 6) Oil is used as a insulation in the power transformers. **False**
- 7) The minimum capacity of power transformer on electrical General Services is 100KVA **True**
- 8) Finance vetting is required, if the cost of NS item exceeds Rs. 50,000/- while
- 9) Procuring through COS. **True**
- 10) The open tenders are to be opened in presence of a Accounts Officer. **True**
- 11) The advantages of ERRU is to obtain pure DC supply and inbuilt over voltage protection. **True**
- 12) The voltage of alternator in running condition cannot be checked at Roof Junction Box. **False**
- 13) The cell voltage of TL coach is 2.2V. **True**
- 14) TL coach alternator produces 35 Amps current. **False**
- 15) The change of liquid state into vapour state is called evaporation. **True**
- 16) Compressor works like a pump by drawing refrigerant vapour from the evaporator and sends to condenser. **True**
- 17) 40 SWG capacity wire is used as fuse wire for fan or light in Distribution Fuse Board. **False**
- 18) The working voltage of 20W/TL inverter is 150V D.C. **False**
- 19) Double test lamp method is adopted to detect earth leakage in a TL coach. **True**
- 20) The maximum permissible voltage drop allowed between the battery and any of the farthest light/fan point shall not exceed 3 volts at battery voltage of 108 ± 2 volts. **True**
- 21) Flame retardant low tension tape is used for insulation of cables in TL & AC coaches. **True**
- 22) Constant voltage method of charging is adopted for charging lead acid cells during POH. **False**
- 23) The width of alternator pulley of 4.5 KW 110V is 140mm. **False**
- 24) Shorting of power diode test to be conducted at full load. **True**
- 25) Bus bars provided in ERRU shall be made of electrolytic copper. **True**

V. SHORT ANSWER TYPE QUESTIONS:

1) What are the Fire prevention measures followed in coaches?

Ans:

- Adequate and proper maintenance of Electrical devices in the coaches as per laid norms.
- All electrical equipments should be maintained properly.
- Check all the electrical circuits for foul (burning) smell, smoke and sparks.
- After completion of the loading, guard must ensure that all the lights in the luggage portion of the SLR are switched “off” to eliminate possibility of short-circuiting.
- Electrical junction boxes should be covered and locked positively in all TL coaches especially in pantry cars.
- Ensure all electrical connections are intact and there are no loose fittings in the coaches.
- Do not allow battery boxes in ‘open’ condition and also MS sheet covering is provided in electrical circuits.
- Ensure correct rated Over load, over voltage protection, fuses/MCBs are provided in electrical circuits.
- Ensure the availability and proper knowledge of usage of fire extinguishers in AC coaches.

2) What are Levels of electrical protections in TL coaches?

Ans:

- a. **Battery:** TL coaches are provided with 120 Ah, 110 V flooded type Lead Acid Battery or VRLA battery. **40 A HRC** fuse provided in main positive side of Battery circuit in under frame.
- b. **Alternator & Regulator:** TL coaches are provided with 4.5 kW alternator & RRU/ERRU. **35 A HRC** fuse is provided in one phase of AC input.
6 A HRC fuse is provided for field control circuit.
- c. **Fuse cum rotary switch panel**
35 A HRC fuse is provided in main –ve circuit.
L1 & L2 lighting circuits are provided with **16 A HRC fuse** each in +ve side.
Fan is provided with **16 A HRC fuse** in +ve side.
SPM circuit is provided with **16 A HRC fuse** in +ve side.
- d. **Fuse Distribution board**
35 SWG re-wirable fuse is provided in both +ve & -ve sides for all individual light & fan fitting.
Each Laptop/mobile charging point is provided with **500 mA/1.0 A fuse** in both +ve & -ve sides.
Emergency light circuit is provided with **6 A HRC fuse** in both +ve and –ve sides.

3) What are the main components of Lead Acid Cell?

Ans. Main Components of Lead Acid Cells are:

- (i) Positive Plates which are tubular in shape made of PbO_2 .
- (ii) Negative Plates usually consists of a lead grid into which active material of Sponge lead is pressed.
- (iii) Separators which are made by Synthetic used between positive and negative plates.
- (iv) Container is made of hard rubber or PPCP with high insulating strength to resist acids which are used as Electrolyte.

(v) Cells cover which covers container having vent plugs and level indicator.

4) What type of batteries are used in TL coaches. Explain briefly about each one of them?

Ans. In TL coaches two type of batteries are used. They are VRLA & SMF batteries.

VRLA batteries: These are the Valve Regulated Cells which works on Oxygen Recombination Principle.

SMF batteries: To overcome problems of frequent topping up and leakage of electrolyte sealed maintenance free batteries are developed. Electrolyte in SMF batteries is in immobilized form and these can be used in any position.

5) What do you mean by PELE box and when it is utilized?

Ans. The equipments available in PELE box are:

- i. TRIPOD STAND
- ii. HOLDER
- iii. FLEXIBLE WIRE 25 METERS
- iv. CROCODILE CLIPS
- v. BULBS
- vi. HAND LAMP
- vii. LOG BOOK
- viii. LAMP FITTINGS

These equipments are used in emergency conditions of train service. This box is kept in the Guard Compartment.

6) What are the Safety Checks in under gear and batteries?

Ans: Alternator:-

1. Alternator safety chains
2. Suspension pin with anti- rotation plate and cotter pin
3. Suspension pin with nylon bushes
4. Alternator pulleys

Axle pulley :-

1. Axle pulley with bolts and split pins.

Battery box:-

1. Condition of battery box channels
2. Check nuts with split pins.

Regulator

Availability of nuts & bolts with split pins

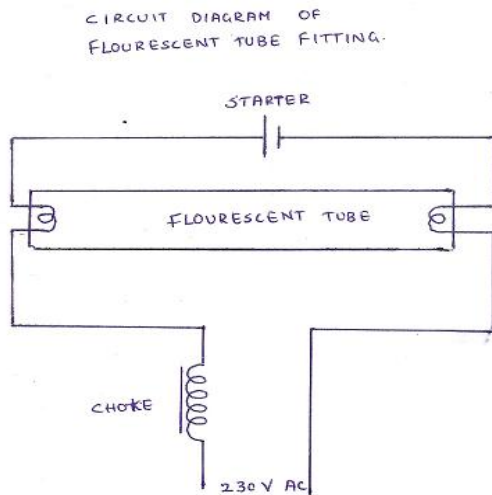
Availability of nuts & bolts with split pins of other under gear electrical suspension equipments.

7) How to check Earth fault with Double Test Lamp?

Ans: Double test lamp having three leads. Centre lead should be connected to earth, left side lead to be connected on positive side (+ve), right side to be connected on negative side (-ve) If both bulbs glow dimly it indicates no earth in the coach. If left side bulb glows brightly it indicates negative earth (-ve) in the coach. If right side bulb glows brightly it indicates positive earth (+ve) in the coach.

8) Draw the tube light circuit diagram. Explain its functioning?

Ans.



9) (a) Define Ohms Law?

Ans. Temperature remaining constant the flow of current is directly proportional to applied Voltage.

$$I \propto V, \quad I = V/R \text{ (resistance of the conductor)}$$

(b) Define Kirchoff's Voltage Law?

Ans. It states, " the sum of the Voltage drops around a DC series circuit equals the source or applied voltage.

$$E = E_1 + E_2 + E_3.$$

(c) Define Kirchoff's Current Law?

Ans. It states " the current flowing toward a point in a circuit must equal to the current flowing away from that point.

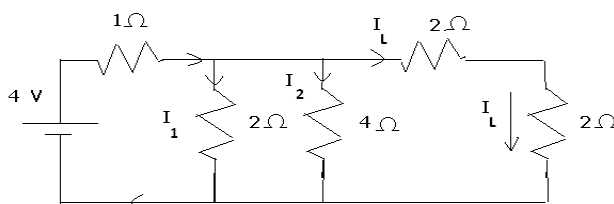
$$I = I_1 + I_2 + I_3.$$

(d) State Faraday's laws of electromagnetic induction?

Ans. **First Law:** Whenever the flux linked with a circuit is changed an e.m.f. is induced in the circuit

Second Law: The magnitude of the induced e.m.f is equal to the rate of change of flux linkages.

10) Find the current load (I_L) in the below mentioned circuit diagram ?



Ans.

$$\text{Resistance of thrid loop} = \frac{(2+2) \times 4}{4} = 2\Omega$$

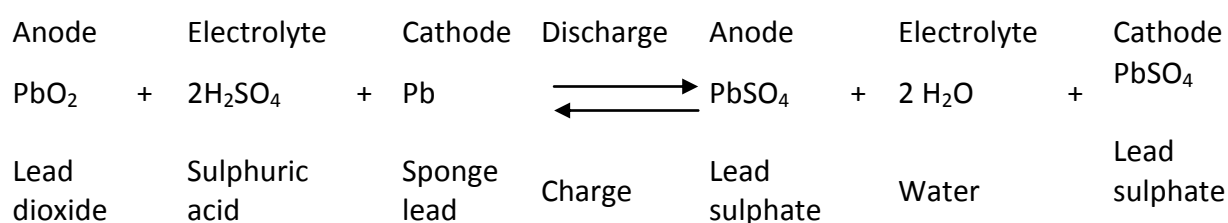
$$\text{Resistance of second loop} = \frac{(2+2) \times 4}{2 \times 2} = 2\Omega$$

$$\begin{aligned} \text{(i)} \quad I_1 \times 2 &= I_2 \times 4 = I_L \times 4. \\ \text{(ii)} \quad I_1 + I_2 + I_L &= 2A. \\ I_1 + I_1 \times 2/4 + I_1 \times 2/4 &= 2A. \\ I_1 [1 + 0.5 + 0.5] &= 2. \\ I_1 &= 2/2 = 1A. \\ I_L = I_1 \times 2/4 &= \frac{1 \times 2}{4} = 0.5A. \end{aligned}$$

Hence, $I_L = 0.5A$.

11) Give the charge and discharge reaction of the lead acid battery?

Ans.



12) What is the difference between SG TL coaches and LHB TL coaches?

Ans:

Sl.No	Item description	SG TL Coach	LHB TL Coach
1	Coach load distribution	From Roof junction Box	Power panel
2	Fuse distribution board	Available	Integrated in the power panel
3	Fans	DC fans	AC fans (2.5 KVA 110 V Dc/AC inverters- 2 no's)
4	Pantry car	Single alternator, single set of battery	Two alternators, Double set of Battery

13) What are the safety items to be inspected on battery?

Ans: Safety items to be checked on battery are full complements of battery box fixing bolts and its tightness, observation of its bottom plate and side plates for damage, full tightness of cell packing, proper securement of anti theft arrangement and battery box cover, full tightness of inter cell connections with double fasteners, correct size of battery fuse, elimination of earth leakage and maintenance of correct polarity, e.t.c,

14) What are the safety items to be inspected on Rotary Junction Box?

Ans: Safety items to be checked on rotary junction box are full tightness of all terminal connections, provision of correct size of HRC fuses, maintaining correct polarity of incoming and outgoing cables, avoiding earthing and shorting of cables.

15) What are the safety items to be inspected on wiring?

Ans: Safety items to be checked on wiring are securing of wiring through cleats with trough casing, provision of correct size of fuses in wiring circuits, elimination of lower size cables, provision of PVC bushes when ever wires passing through metal parts, eliminations of temporary wiring, avoiding of earthing and shorting of cables etc.

16) What are the reasons for loss of residual magnetism? How do you regain it? What is the permissible and maximum DC voltage is to be applied to regain the residual magnetism?

Ans. The reasons for loss of residual magnetism are keeping the alternator in idle condition for long time and connecting field wires in wrong polarity. To regain the residual magnetism flash the field terminals for correct polarity of DC supply. The permissible DC voltage is to be applied to regain the residual magnetism is 6 to 12V DC. Maximum voltage is 24V DC.

17) What is the purpose of belt-tensioning device? What are the parts it consists of?

Ans. The purpose of belt tensioning device is to keep V belts in tight condition.

Its parts are

1. Tension rod
2. Tension spring
3. Belt tension indicator with spring seat
4. Fork eye
5. Fork eye side spring seat
6. Belt tightening nut
7. Free end pipe and nut

18) What are the main components of Lead Acid cell?

Ans. Main components of Lead Acid cells are:

- a) Positive Plates, which are tubular n shape, made of PBO₂
- b) Negative Plates, usually consists of lead grid into which active material of Sponge lead is pressed.
- c) Separators, which are made by Synthetic, used between Positive and negative plates.
- d) Container is made of hard rubber or PPCP with high insulating strength to resist acids which are used as Electrolyte.
- e) Cell covers which covers container having vent plugs and level indicator.

19) Enumerate the cable sizes used in TL coaches?

Ans. **Roof wiring**

Branch wiring	:	4 sq.mm Aluminium,
LI, LII & F+ve	:	16 sq.mm Aluminium,
SPMI&II	:	16 sq.mm Aluminium.

Under frame wiring

Alternator to regulator, field winding	:	6 sq.mm copper.
Main windings	:	16 sq.mm copper,

Regulator to under frame junction box : 35 sq.mm Al.
UFJB to Battery box : 35 sq.mm Al.

20) Why earthing is necessary for any electrical equipments, domestic installation & service building etc? For TL coaches what is the minimum I.R. value required for new wiring?

Ans: To drain away any leakage of currents due to poor insulation and to save human life from dangerous shock and also to avoid burnt of electrical equipment.

The minimum IR value required for wiring is $2M\Omega$'s and minimum IR value required in service for giving coach fit for service is $1M\Omega$.

21) Practically demonstrate to use Fire extinguisher?

- Ans:
- a) **P** -Pull the pin at the top of the extinguisher.
 - b) **A** -Aim the nozzle towards the base of the fire.
 - c) **S** -Stand approximately 8 feet away from the fire and squeeze the handle to discharge the extinguisher.
 - d) **S** -Sweep the nozzle back and forth at the base of the fire.

22) What are the precautions to be taken before starting work on electrical installations?

Ans: Before starting any electrical works on installations disconnect the power supply to the Electrical equipment and discharge & connect earth. If any capacitors are connected, it has to be discharged properly. Test with meters for any availability of supply then start the work.

23) How do you conduct insulation resistance test on 100 VA inverter used for Laptop and mobile charging sockets used in RC SG coaches?

Ans: The insulation resistance of the inverter shall be measured with 500v megger as given below:

- a) Between input terminals shorted together and the housing with output being kept in open circuit condition.
- b) Between the output terminals shorted together and keeping the input terminals in open circuit. The insulation resistance values measured thus shall not be less than 10 Mega ohms in each test.

24) Write about the working principle of TL/AC alternator?

Ans. The core of the stator which is completely embraced by the field coils, will retain a residual magnetism if excited by a battery once. The flux produced by the filed coils find its path through the rotor. When the rotor is rotated the passage of rotor teeth and slots, alternatively, under the field, offers a varying reluctance path for the flux produced by the field coils. The flux, which varies periodically, links with AC coils and induces an alternating voltage in AC coil. The frequency of the induced voltage depends on the speed of rotor, where as the magnitude depends on the speed of the rotor and the level of excitation. The field is controlled through regulator to attain desired output voltage by means of positive feedback again.

25) What are the precautions to be taken while loading and unloading of alternator?

- Ans.
- i) While unloading and loading alternator, see that the terminal box and pulley should not be broken.
 - ii) The alternator to be loaded in correct way that bushes to be provided in proper place.
 - iii) While loading and unloading proper precautions to be taken not to fall on ground otherwise men/materials will be injured/damaged.
 - iv) See that the anti rotating clamp provided on trolley coincides with alternator suspension pin.
 - v) Replace the worn out alternator and alternator suspension bracket bushes.

- vi) See that the alternator should not have play with proper washers in improper place to align the axle pulley.
- vii) Safety chains and cotter pins to be provided without fail.

26) Give important measures adopted by railways for prevention of fires in TL coaches?

Ans. a) Cable sizes have been standardized.

- b) Provision of fuse on both positive and negative side in FDB
- c) Use of self extinguishing PVC cables.
- d) Provision of rubber grommets at points where the cable enters through metal members in the coach.
- e) Proper crimping at the cable terminals.
- f) Air clearance of 10 mm between live part and earth and between parts of opposite polarity.
- g) Replacing of cables with any joints, noticed during POH.
- h) Re-wiring of the coach planned on the basis of cable life of 15 years.
- i) Use of Flame retardant Insulation tape.
- j) If I.R. value of wiring is less than 1M, rewiring should be taken up.

27) What precautions will you take during re-wiring of a coach?

Ans.

- a) Use of PVC cables of suitable current.
- b) In under frame and end walls of coach the wiring has to be drawn through Rigid steel conduits
- c) Use of proper size of fuses.
- d) The phase and field wires from the Alternator to terminal box shall be run in one flexible PVC conduit and from terminal box to rectifier – cum-regulator & from rectifier-cum-regulator to under frame terminal board in one rigid steel conduit.
- e) Proper method of crimping by using proper die and use of corrosion inhibiting compound during crimping of Aluminium cables.
- f) Segregation of positive and negative cables.
- g) Cables in the roof (super structure) to be carried in non-metallic rigid conduits with proper cleating arrangement.
- h) Use of FRLT insulation tape.
- i) After re-wiring the test the insulation resistance with 500v dc megger. The minimum insulation resistance should be 2 Mega ohms.

28) What are the disadvantages of 110 Volts DC Train lighting System?

Ans: Disadvantages:

- a) In the 120 volts system single battery is provided load on the battery is more. The life of the battery is reduced considerably.
- b) Due to introduction of transform mounting system the complete coach has to be lifted for replacement of V belts.
- c) Due to provision smaller size batteries, the quantity of electrolyte is limited. If the level of electrolyte is not maintained by adding distilled water, the batteries may damage.
- d) Due to high voltage system, requires high value of insulation resistance for safety etc.

29) What are the major train lighting equipments available in Self Generating coaches?

Ans. The major train lighting equipments in coach are

- a) Alternator
- b) Rectifier cum Regulator Unit

- c) Battery
- d) Axle Pulley
- e) Rotary/ Roof Junction Box
- f) Under frame Junction Box
- g) Fans
- h) Lights
- i) EFT
- j) BCT

30) What are the sizes / capacity of fuses provided at various locations of 110 Volts Train Lighting coach?

Ans.

Sl. No.	Circuit fuse	Location	Fuse size	Current rating
1.	Positive/negative	Branch fuses	DFB 35 SWG RW	6A
2.	SPM1 & SPM2	Junction box	16A HRC	---
3.	Main negative	Junction box	35A HRC	---
4.	L1, L2, and F +ve	Junction box	16A HRC	---
5.	Battery fuse	Battery box	40A HRC	---
6.	Field fuse	Regulator box	6A HRC 20	6A
7.	AC fuse	Regulator box	35A HRC	---

31) What was the latest proforma issued by Railway Board for special drive to prevent fire in TL coaches during trip inspection?

Ans: The latest proforma issued by Railway Board for special drive to prevent fire in TL coaches during trip inspection is given below:

Sl. No.	Depot	Date	Train No.	Coach No.	Earth Leakage (Y/N)	Incorrect rating of HRC fuses (Y/N)	Rewire able fuses replaced with HRC fuses (Y/N)	Availability of OVP in RRU/ERRU (Y/N)	Condition of FDBs (Y/N)	Loose wires & connections (Y/N)	Remarks
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32) Explain Trickle Charging of Batteries?

Ans: When a battery is kept as an emergency reserve, it is very essential that it should be found fully charged when an emergency arises. Due to leakage action and open circuit losses, the batteries deteriorate .Hence to keep it fresh, batteries are kept on a small charging.

For example: A standby battery for station bus-bar of 400 Ah at 10 hr rating, a continuous trickle charge of 1 Amp will keep the cells fully charged and keep in perfect condition.

VI. ESSAY ANSWER TYPE QUESTIONS :**1) List items to be checked in trip inspection of TL coaches?**

Ans:

- i. Feel alternator temperature for generation. Warm- Generation OK, Cool- Check for generation.
- ii. Replace field fuse if found blown
- iii. Check continuity of field & phase windings with the help of test lamp/multimeter.
- iv. Checks for residual magnetism, in case of loss of magnetism provide 12V flash.
- v. Check for continuity between alternator and regulator.
- vi. Check the condition of safety chain and availability of split pins in safety chains
- vii. Check the alternator suspension bracket and tension gear for damages and replace if any.
- viii. Check for availability of alternator castle nut.
- ix. Check for availability of all V-belts and without and twist.
- x. Check the V- belt tension with the help of 4 Kg weight and adjust accordingly.
- xi. Ensure 30mm gap between bracket and free end bush collar
- xii. Check for any shift of axle pulley, the gap between axle pulley and wheel hub.
- xiii. Check for level of distilled water in lead acid cells and top-up if required.
- xiv. Clean sulphation if any.
- xv. Ensure HRC fuse of correct rating & in working condition.
- xvi. Check for any earth leakages and take remedial action.
- xvii. Check for tightness in terminal connections
- xviii. Check for availability of cable cleats, clamps, and grommets for all cables.
- xix. Check and replace any equipment.

2) List items to be checked in monthly inspection of TL coaches?

Ans: In addition to trip schedule the following examinations to be carried out

- i. Check for tightness of terminal connections of alternators.
- ii. Thoroughly clean externally
- iii. Open Inspection cover of regulator and blow off dust with the help of blower.
- iv. Check locking of current settings in the regulator
- v. Check for availability and proper fixture of castle nut and split pin.
- vi. Record Specific gravity of each mono block on On load and Off load.
- vii. Charge the cells through BCT until the specific gravity raises to value of Pilot cell.
- viii. In case $1/3^{\text{rd}}$ of total cells are with low specific gravity, the entire set to be replaced
- ix. Cells showing reverse/ zero volts should be withdrawn and replaced by charged cells.

In addition to the works mentioned in Trip & Fortnightly Examination, carry out the following.

Alternators, Rectifier & Regulators:

- a) Check for tightening of terminal connections of alternators and rectifier regulators.
- b) Thoroughly clean externally the alternator & regulator.
- c) Open inspection cover of regulator. Blow dust with a portable blower. Secure cover tightly after inspection.
- d) Check locking of current setting of regulator, if disturbed it should be reset/locked as prescribed.
- e) Check the alternator pulley for proper fixture and the availability of castle nut & split pin.

Axle pulley:

Watch for shifting of axle pulley by observing the white band on either side of pulley. Reset the correct position of pulley, if found shifted and tighten the loose nuts with torque wrench with

recommended torque. Check the tightness of nuts and also availability of check nuts and split pins in all fixing bolts.

Batteries:

Record specific gravity of individual cells/monoblock. “Switch on” load full load of the coach and record individual voltage of cells and total voltage. “Switch off” load. If the specific gravity is less than that painted on the battery box, charge the cells as specified under “Trip Examination” after topping up with DM water, if required.

Use battery charging terminals provided on coaches for charging purposes. Charging should be continued till the specific gravity rises to the value of mentioned in battery box on “Pilot” cells. In case pilot cells show no appreciable improvement, check specific gravity of adjacent cells. If the specific gravity does not improve in spite of charging replace the battery by another set and send the defective battery to Depot/Shop for treatment at the earliest. Cells should be handled with due care while unloading and in transit to avoid breakage. Adequate facilities should be created in Depot for treatment of cells which do not pick up charge. Sulphation will be the main cause for this and sulphated cells should be treated for their recovery as specified.

On completion of charging, record the specific gravity of individual cells. If there is any wide variation in the specific gravity/voltage of cells, disconnect and replace those cells showing low specific gravity/voltage by spare ones. In case there are more than $1/3^{\text{rd}}$ of total cells with low specific gravity, the entire set should be replaced. Cells showing reverse voltage, zero volts should be withdrawn and replaced by charged cells immediately.

Record individual voltage of cells and the total voltage on full load of the coach. Change the marking of the pilot cell as given in table.

Junction Box:

Open front door. Check all connections in MCB cum fuse panel for tightness any for heating sign, fuses etc. Check availability of terminal lugs for all cables in junction box and replace if necessary by terminal lugs of correct size. Check rotary switch/MCBs provided for lights, fan circuits for correct condition and Rotary Switch and EFTs for proper operation. Replace/repair defective MCBs. If MCBs are not readily available provide rewirable fuses of appropriate ratings, purely as a stop gap measure. Check up negative fuse and replace if necessary by different ratings of HRC fuse for AC and non-AC coaches. If rotary switches are provided instead of MCBs, check for proper operation. Check up HRC fuses provided with rotary switches for correct ratings and replace, if necessary. Close front door and secure properly by the locking key. If found defective, the same may be attended/replaced.

Wiring and accessories:

In addition to the items listed under trip inspection, the following items shall be inspected. Superstructure wiring and under frame wiring shall be tested separately for which the main negative fuse in shall be opened and controlling MCBs for all circuits kept off. All other fuses shall remain in circuit. Insulation resistance shall be measured with all fittings and equipment connected both on under frame and superstructure. The under frame wiring shall be tested with battery fuse open. The IR value should be minimum 2 mega-Ohm in fair weather condition and min. 1 mega-Ohm under adverse weather condition. Availability of inspection cover of DFBs should ensured.

Fans

In addition to the items listed under trip examination the following works shall be carried out.

- The fan body, guards and blade shall be thoroughly cleaned with cloth.
- All fans shall be opened and condition of commutator, brushes and brush gear shall be thoroughly checked. Action should be taken where necessary as given under Trip attention.

- All fans shall be opened and condition of commutator, brushes and brush gear shall be thoroughly checked. Action should be taken where necessary as given under Trip attention.
- Studs used for fixing the fan to coach body, shall be checked and tightened, wherever necessary. Availability of all the three fixing studs should be ensured.
- All the switches controlling the fans shall be checked for its smooth operation and correct working and replaced, where necessary.
- Fan regulators in upper class coaches shall be checked for smooth operation from one position to the other. In case the regulators are not regulating the fan speed, the resistance box shall be checked and replaced where necessary.
- Fan blades shall be replaced if found bent, or if there is no proper air discharge.

Carriage Lighting:

In addition to the items listed out under “Trip Examination” proceed as follows:

- Open each fitting with the dome key and remove the dust of the fitting both from inside and outside. Ensure free operation of locking mechanism and replace defective fitting. Clean glass domes first with wet cloth and then with a clean dry cloth.
- Replace rusted fittings and fittings with damaged surface.
- Check up whether toggle switches are marked to indicate lighting control “L” night light control “NL” side lamps in guards compartment as “SL” tail lamps as “TL-Rear” “TL-Front” luggage room as ‘LRL’ if not, stencil legends with fluorescent paint.
- Check up all lighting circuit fuses in each coach for correct sizes and replace if necessary. Stencil the sizes of fuses near the locations, if not already done.
- Mark inspection covers of distribution fuse boards as DFB if not done already.
- Thoroughly clean metal guards for roof light fittings in luggage rooms and paint, if necessary.

Tumbler/Toggle Switches:

Check each toggle switch of lights and fans for proper fixing and operation. Replace defective toggle switches. Toggle switches should be provided in the locations intended for them and provided with covers with their knobs exposed for operation by passengers.

Distribution fuse boards and fuse cut-outs:

Check distribution fuse boards and fuse cut outs of light and fan circuits, for tightness of connections and provisions of correct size of fuses in the fuse terminals. Replace missing distribution fuse board covers.

Emergency Feed Terminals (EFTs):

Check up supply and making of polarity of EFTs. Replace missing EFTs and those without wiring nuts.

3) What are the points to be attended during Fortnightly schedule on TL coaches?

Ans: In addition to the instructions contained under “Trip examination” the following works shall be carried out:

- Clean the interior of battery box.
- Clean the cell tops and deposits of sulphate, if any in inter cell and end cell connections.
- Remove sulphated inter cell connections, clean the connecting surface with piece of cloth. Use fresh fasteners, sulphated internal connections and fasteners should be soaked in kerosene oil. Cleaned with warm water and kept ready for use.

- Inter cell connections should be provided with both small and large strips and four fasteners each with one hexagonal nut, one spring washer to IS:3063 and two steel punched washer to IS:2016.
- Remove end cell connectors, clean the connecting surface both in cell and connector thoroughly and provide back. Check for proper crimping of terminal. In case strands of connecting cable are found cut at the crimping end and re-crimp with a new inter cell connector. End cell connector confirming to IS: 6848 should only be provided. Tinned copper crimping sockets with a single hole if any provided as a stop gap measure should be replaced by standard end cell connector. Provide end cell connectors with both the fasteners each with one spring washer to IS: 3063 and one punched steel washer to IS: 2016.
- Tap sealed float guides and check for free movement. Look for elongated holes in sealed float guides and replace such guides. Replace deficient floats promptly.
- Check whether vent plugs are of the anti-splash type and replace if required.
- Check the make of cells and the lug date. Different makes of cells mono blocks if found mixed together should be replaced by a single make of cells. If it is not possible to do this during one fortnightly examination this should be noted down and attempts made to replace the same during the next Fortnightly Examination.
- Check whether cell/mono block packing is tight and provide additional packing, if necessary. Use only hard wood coated with acid resistant paint for cell packing. Never use untreated wood or plywood for packing of cells/mono block. If any cell/mono block is found cracked, replace it promptly.
- Check for provision of anti-theft rods and provision of nuts, both inside and outside the battery box on either side. Replace deficient rod and nuts.
- Apply petroleum jelly on inter cell connection and end cell connections. Do not use grease.
- Check battery fuses and replaces overhead/incorrect size of fuses by correct size.
- Check battery box fixing nuts for tightness. VRLA batteries: SMI No. RDSO/PE/TL/SMI/0001-98 I Rev. 0 dated: 01/06/1998 to be followed.

4) List items to be checked during IOH of TL coaches?

Ans: In addition to Trip, monthly, fortnightly inspections the following has to be done during IOH schedule

- Check alternator terminal board, incoming & outgoing terminal connection, covers, lugs, clamps & cleats, grommets, flexible pipes etc.,
- Check condition of axle pulley, rubber pads, nuts, lock nuts, split pins and replace pulley, if grooves for wear and tear. Replace pad if shifting mark or perish.
- Check axle pulley gap between the two halves of axle pulley is 3 mm.
- Check the distance between axle pulley edge and wheel hub
- Check the spring tension of tension rods by its guide plates.
- Checking of Gap between Tension device supporting plate and Tension Device sleeve
- Checking of Alignment between Alternator Pulley and Axle Pulley
- Replace V-Belts and transom mounting bushes.
- Lubricate Tension rod & adjusting nut
- Check the regulator box (ERRU/RRU), remove all dust particles by compressed air externally & clean with soft brush inside area.
- Check gaskets and replace if required
- Record battery set ON/OFF load voltage and specific gravity of individual cells

- xiii. Check suspension arrangement of battery box and its condition. If any cracks or corrosion is noticed, it shall be attended. Paint if required.
- xiv. Discharge the battery bank with full coach load for 15 minutes & record the voltage during discharge. If all are above 1.98 and above battery is healthy, provide normal charging. If some of the cell voltages are less than 1.98 Volts, then give boost charging with 2.30 VPC for 12 hrs. by charging them separately with current limited to 20% of rated capacity. The weak cells which are charged separately must be checked through a discharge at C-10 rate for 30 minutes, the end of discharge voltage should be above 2.0 V. If such a re-charged cell fails to qualify the above test, it should not be replaced back in the coach.
- xv. Clean the junction boxes & tighten the connections.
- xvi. Check working of rotary switches, etc.
- xvii. Check all the safety devices are in working order.
- xviii. Ensure availability of correct rating of HRC fuses in panel board.
- xix. Check earth leakages (+ve and –ve).
- xx. Clean all fans commutator, carbon bushes & lights fittings internally & externally.
- xxi. Check all switches, fan regulators for proper working.
- xxii. Check working of all mobile/laptop charging points and emergency lights.
- xxiii. Check the availability and working of PAC lights.

5) List the items to checked in OFF POH arrived coaches?

Ans:

1.0

MUST CHANGE ITEMS To be replaced DURING EVERY POH:

Sl. No. Description of items To be replaced

A. Alternator with pulley

- 1 Suspension pin with lock nut
- 2 V-belt
- 3 Alternator nylon bush
- 4 Bogie bush
- 5 Cotter pin for locking suspension pin
- 6 Axle pulley rubber pad
- 7 Washers (Spring & Flat)
- 8 Studs with nut, check nut & split pin for axle pulley
- 9 Split pins
- 10 Tension rod sleeve
- 11 Tension rod springs

B. RRU/ERRU

- 1 Regulator fixing nut bolt on cradle
- 2 Sponge rubber gasket
- 3 Split pin

C. Battery

- 1 Battery box suspension bolts, nut, split pins
- 2 FRP tray
- 3 Changing of batteries
- 4 Vent plugs
- 5 Float guide
- 6 Connecting strips/leads of lead acid batteries with nut & bolts

D. Cables Conduit etc.,

- 1 Rubber grommets, fittings and cleats

- 2 Jointed cables
- 3 PVC flexible conduits

E. Light Fittings

- 1 Sealing gasket
- 2 Diffuser/Wire Mesh

F. Carriage Fan

DC/AC fans

- 1 Insulation rubber pads
- 2 Carbon brush spring
- 3 Carbon brush
- 4 Painting of Fans

G. Any other items/components

- 1 All gaskets, grommets, jointed cables, cleats
- 2 Rotary switches

2.0 MUST CHANGE ITEMS To be replaced DURING ALTERNATIVE POH:

Sl. No. Description of items To be replaced

A. Alternator with pulley

- 1 Bearings
- 2 Axle pulley for 'V' belt
- 3 Tension rod complete assembly

B. RRU/ERRU

Cover fixing flying nut bolts

D. Cables Conduit etc.,

Under frame cables rewiring

E. Light Fittings

Reflector

F. Carriage Fan

DC/AC fans

Ball bearing 6200

Brushless DC fans

Ball bearing

G. Any other items/components

- 1 HRC fuse base
- 2 Battery charging terminals

3.0 RDSO modifications to be carried out

Sl. No. Description of modification

- 1 Modification sheet for the cover for fuse distribution board used in general second class and 2nd class SL coaches.
- 2 Modification in battery charging terminal cum fuse box plate for provision of 40 Amp. HRC fuse instead of re-wire able fuse.
- 3 Provision of over voltage protection in rectifier regulator unit of 4.5 kW alternator.
- 4 Checking for Emergency Light Unit
- 5 Shifting of junction box from guards compartment to passenger area
- 6 Provision of modified terminal box cover for 4.5 kW TL Alternator
Arrangement for anchoring of outgoing cables from alternator terminal board/box to rectifier-cum-regulator terminal box and under frame terminal board of 4.5kW brushless alternators used on SG coaches.
- 8 Provision of modified terminal board assembly in 4.5/18/25 kW alternators.

- 9 Modification in HMTD make RRU for train lighting coach.in 4.5 KW regulators
- 10 Provision of filter circuit in rectifier cum regulator unit of 4.5 kW Regulators used in SG BG coaches.

4.0

Condition of other items

Sl. No. Description of items To be replaced

A. RRU/ERRU

- 1 Painting
- 2 Gasket

B. Battery

- 1 Condition of Battery box frame
- 2 L-clamps for covers

C. Light Fittings

- 1 Painting of Wash basin light fittings
- 2 ACP light fitting with red color paint
- 3 ELUs
- 4 LED Tail lamps (for SLR)
- 5 Reflectors
- 6 All types of screws for above fittings

D. Carriage Fan

DC/AC fans

- 1 Base bolts
- 2 All types of screws

E. HRC Fuses

- 1 Main Battery fuse
- 2 Main -ve fuse in RJB
- 3 L1 fuse in RJB
- 4 L2 fuse in RJB
- 5 Fan fuse in RJB
- 6 SPM fuse in RJB
- 7 Fuses for ELU in RJB

F. Any other items/components

- 1 Proper locking of RJB
- 2 FDB covers without any gap
- 3 Mobile charging points
- 4 +ve' Earth Leakage
- 5 -ve' Earth Leakage
- 6 I.R values of Wiring
- 7 LED Desitination board +ve to be connected in the output of Fan circuit
- 8 Joints near FDB of LED Destination board
- 9 Tightness of connections in underframe junction box

G. Stenciling of

- 1 Battery boxes
- 2 Regulators
- 3 Emergengy Feed Terminals
- 4 Battery Charging terminals
- 5 Roof Junction Boxes
- 6 FDB's

6) Explain the procedure of V-Belts replacement? Explain reasons for dropping of V-Belts?

Ans: **Procedure of replacement of V- Belts:-**

- i. The tension rod of the coach is removed by ETL staff
- ii. The axle box safety loops and brake hanger pins are removed by C&W staff to facilitate insertion of new V- Belts.
- iii. The coach is lifted with the help of Jacks and springs & dashpot are removed by C&W staff.
- iv. The belts are moved on the wheel one by one.
- v. The V-Belts are secured between wheel axle pulley and Alternator pulley.
- vi. The V-Belts are tightened with the help of Tension rod.
- vii. The Tension has to be adjusted so that Then provide fixing nut, check nut and split pin leaving a gap of 30 mm non AC coaches at free end side of tensioning for mechanism.
- viii. Then observe the tension of belt with the help of 4Kg weight of the second belt from alternator, if the belt hangs completely below the straight line of adjacent belt the tension has to be increased. Repeat until the belt is lifted to the straight line of adjacent coach.

Reasons for belt dropping in en- route:-

- ix. Belts having excessive tension
- x. Belts having lower tension
- xi. Correct gap not maintained between bracket and free end bush collar of tensioning device
- xii. Mismatched of V Belts grade
- xiii. Mis alignment of axle pulley and alternator pulley
- xiv. Over loaded Alternator due to heavy earth leakage
- xv. Twisted belts not rectified in time.
- xvi. Foreign body entangles the belts.

7) Explain the procedure for through feeding in TL coaches in case of adjacent coach is dark/dim?

Ans: The detailed procedure of emergency feed extension is given as under

1.0 Action to be taken in healthy coach

- 1.1 The availability of power supply in the emergency feed terminal should be ensured.
- 1.2 Only one dark coach should be extended feed supply from one healthy coach.
- 1.3 Before connecting, the polarity of healthy coach as well as dark coach shall be checked.
- 1.4 L-II circuit of the healthy coach shall be switched off before connecting supply to dark coach.
- 1.5 The rotary switch of (socket paralleling main) SPM-I and II shall be kept in ON position.

2.0 Action to be taken in defective coach and feed extension

- 2.1 L-II and fan circuit of the dark coach shall be switched off before connecting supply from healthy coach.
- 2.2 The rotary switch of (socket paralleling main) SPM-I and II shall be kept in ON position.
- 2.3 The L-I circuit is having essential/emergency lighting circuit. This includes all lavatory lights 50% of compartment lights, and night lights in all types of IIInd class coaches.
- 2.4 Remove (+ve) fuse from battery box and)-ve) main fuse from junction box to disconnect the power supply to/from battery.
- 2.5 The earth fault shall be checked up with the help of testing lamp. If earth fault is there then feed extension should not be done.
- 2.6 The feeding shall be given to L-I circuit only of the dark coach from healthy coach.
- 2.8 The defective coach shall be attended and cable should be removed at the first available opportunity by TL staff.

- 2.9 The size of the cables for the feed extension shall be of 16 sq.mm PVC Aluminium /2.5 sq.mm elastomeric /2.5 sq.mm e-beam copper cables.
- 2.10 The length of the wire for feed extension shall be 2x1.5 meter (for both terminals). The length of the cable shall not be more than 1.5 meter.
- 2.11 Both ends of the cable shall be provided with suitable size of lug.
- 2.15 The cable shall be secured tightly by the screws or bolts, nuts and plain washer. The proper tightness of the connections should be ensured.

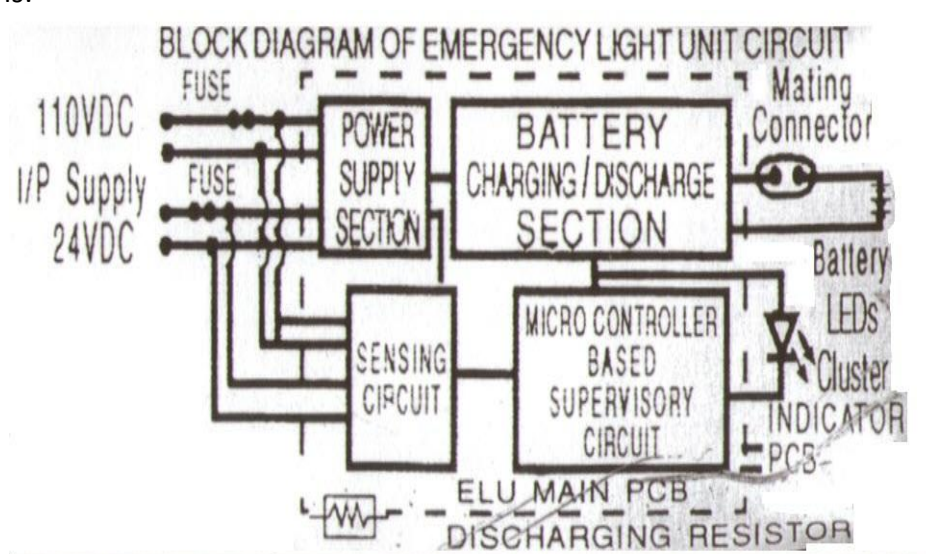
8) (a) Write about the LED based Emergency Lights provided in TL & AC Coaches?

Ans: The general lighting inside the TL and AC coaches is provided by 110V DC supply with battery backup system. But during extreme emergencies like derailment and accidents etc. or regular supply system failure, causing total darkness inside the coach. To facilitate easy exit of passengers and their immediate rescue, during such situations an emergency light unit (E.L.U) system is developed to provide illumination which are located inside the coaches at the passage and on the doorways for use of movement of passengers.

Emergency light consists of LED based lights working on 12V DC supply by battery. The charging of the battery 12V, 12AH is done with 110V DC/ 12V DC , DC-DC converter. When the coaches equipment working satisfactorily the 12V battery will be charging with the help of coach supply. This unit will switch "ON" automatically on failure of normal supply system.

(b) Draw the block diagram of LED based emergency light unit provided in TL and AC coaches and mention the indications provided?

Ans:



INDICATIONS:

- "GREEN LED" indicates the healthiness of battery.
- "RED LED" indicates the input power failure of 110V DC or card failure
- "AMBER LED" indicates that the battery voltage has dropped to 10.5V or below.

(c) Explain the operating instructions of LED based Emergency Light Unit?

Ans: This E.L.U. is designed for trouble free operation and easy installation in the coaches.

- i. Ensure that the power supply is available always to the E.L.U. in normal condition and during halt time of the coach.
- ii. Ensure that the input supply connections are tightened properly on supply terminals provided on the box.
- iii. Ensure that the mate connector (02 pin) provided inside the unit always connected i.e. Male/Female connections are made without fail.
- iv. Discharge the E.L.U. battery for at least $\frac{1}{2}$ hour on every primary maintenance of the coach when not in use by removing the coach battery fuse for $\frac{1}{2}$ hour.

9) (a) What are the technical requirements of 100 VA static inverter recommended for cell phone charging and Laptop sockets used for 110V coaches?

Ans: Rated input voltage = 110 volts DC.
 Input voltage range = 90V to 140V.
 Input current = 1 Ampere.
 Output voltage = 110V $\pm$ 5% AC.
 Output frequency = 50 Hz $\pm$ 5%
 Output wave form = sine wave.
 Efficiency = more than 85%

(b) What is the acceptance and routine test shall be conducted on 100 VA inverter used for laptop and mobile charging sockets?

Ans: (i) **Acceptance Test:**

- a) Physical dimension and constructional features verifications test
- b) Performance characteristics test and rating test
- c) Over voltage test
- d) Open circuit test
- e) Short circuit test
- f) Temperature rise test
- g) High voltage test
- h) Insulation resistance test
- i) Reverse polarity test

(ii) **Routing Test:**

- a) Physical dimension and constructional features verifications test
- b) Performance characteristic test and rating test
- c) Over voltage test
- d) Insulation resistance test
- e) Reverse polarity test

(c) What are the markings to be provided on 100 VA inverter used for Laptop and mobile charging sockets used in RC SG coaches?

Ans: The inverter shall be provided with an anodized aluminum name plate and riveted to the back side of the inverter marked with the following information.

- a) Name of the manufacturer with logo.
- b) Type.
- c) Serial number (first two digits the year of manufacturer, next two digits the month, one digit version code and next four digits running serial number).

- d) Wiring diagram (with sketch) indicating the position of terminals Rated input voltage.
- e) Nominal input voltage.
- f) Rated output voltage at nominal voltage.
- g) Rated output current at nominal voltage.
- h) Frequency.
- i) VA rating.

10) What are the important parts of ERRU and explain its advantages and disadvantages?

Ans: Important parts of ERRU:

- Isopack power diodes
- Universal voltage controller
- IGBT controlled field circuit
- Hall sensor
- Static over voltage protection
- Interface unit
- LED/alpha numerical display

Advantages:

- a) Control circuit is Modular type design.
- b) Auto identification of alternator ratings and indications.
- c) Auto setting of parameter of voltage, load current, Battery current, over voltage, over current and current limiting for all the regulator of 4.5 kw, 18kw and 25kw.
- d) UVC is interchangeable with all types of electronic regulators from 4.5 kw to 2.5 kw.
- e) Close regulation of voltage ± 2 V over the entire range of load and speed to have uniform charging of batteries.
- f) Less voltage and current ripple on Battery Charging current.
- g) Controlled battery charging current to have longer life of batteries.
- h) Moulded Hall sensors for current sensing and setting current limit.
- i) Static over voltage protection and latching without battery.
- j) Isolated power packs directly mounted on the heat sinks to have better heat dissipation.
- k) Moulded PCBs to avoid dust and vibration problems.
- l) Separate interface unit for monitoring the parameters like DC Voltage, DC current, Battery charging and discharging currents, Amps Hours etc.
- m) This interface facilities to store AH.IN and AH.OUT, generation and non-generation time, total distance travelled by coach and faults occurred in the regulators.
- n) This interface also has Emergency unit. In case of failure of one control unit, the other control unit will take care of both regulators.

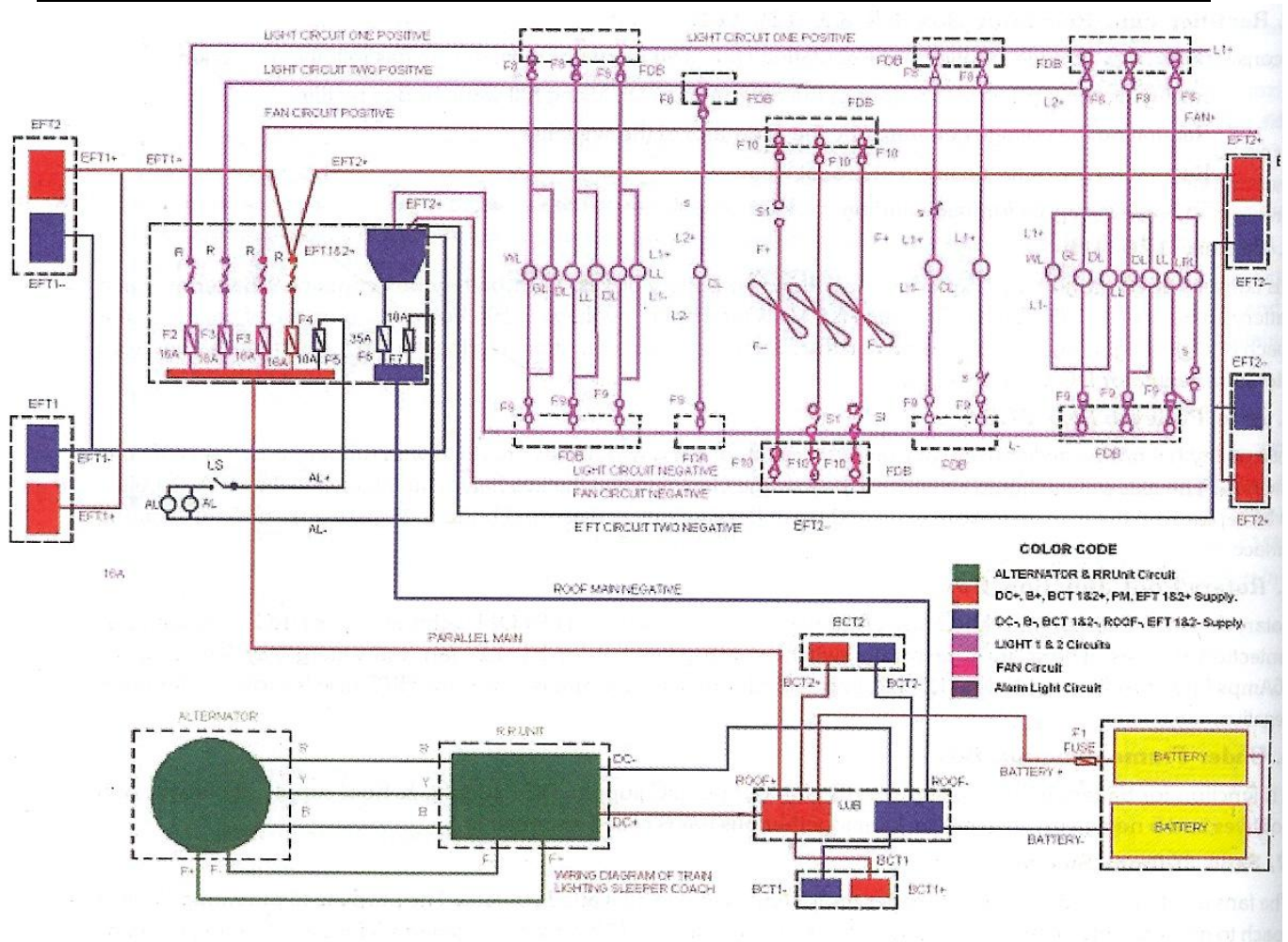
Disadvantages of ERRU:

- a) Sophisticated electronic equipment.
- b) Qualified staff is required for maintenance.
- c) Costlier than MA type regulator.
- d) If PCB failed entire PCB to be changed.
- e) For repairing ERRU on test bench, Alternator supply must be required.
- f) Alternator setting cannot be adjusted manually on test bench.
- g) Costlier spare parts are to be stocked.

11) Draw the neat Coach Wiring Diagram of 110V DC TL system including capacities of equipment and protection devices?

Ans.

Diagram Of 110 Volts DC TL System Including Capacities Of Equipment And Protection Devices



MAJOR EQUIPMENTS IN TL COACH:

- Alternator – 4.5 kw, 110V, 3phase, brush less type, totally enclosed, reversible shunt wound
- Regulator Board-4.5 kw
- Battery-120 Ah, 110V DC, lead acid / VRLA type
- Light -15 w / 20w.110V DC
- Fans-40w
- V-belts, axle pulley, alternator pulley

PROTECTIVE DEVICE:

- OVR / OVP
- HRC fuse (40 A , 16 A, 6A)
- Rotary switch (40 A)

12) Write down the procedure to maintain correct tension of new 'V' belts on bogie transform mounted alternator of non AC coaches?

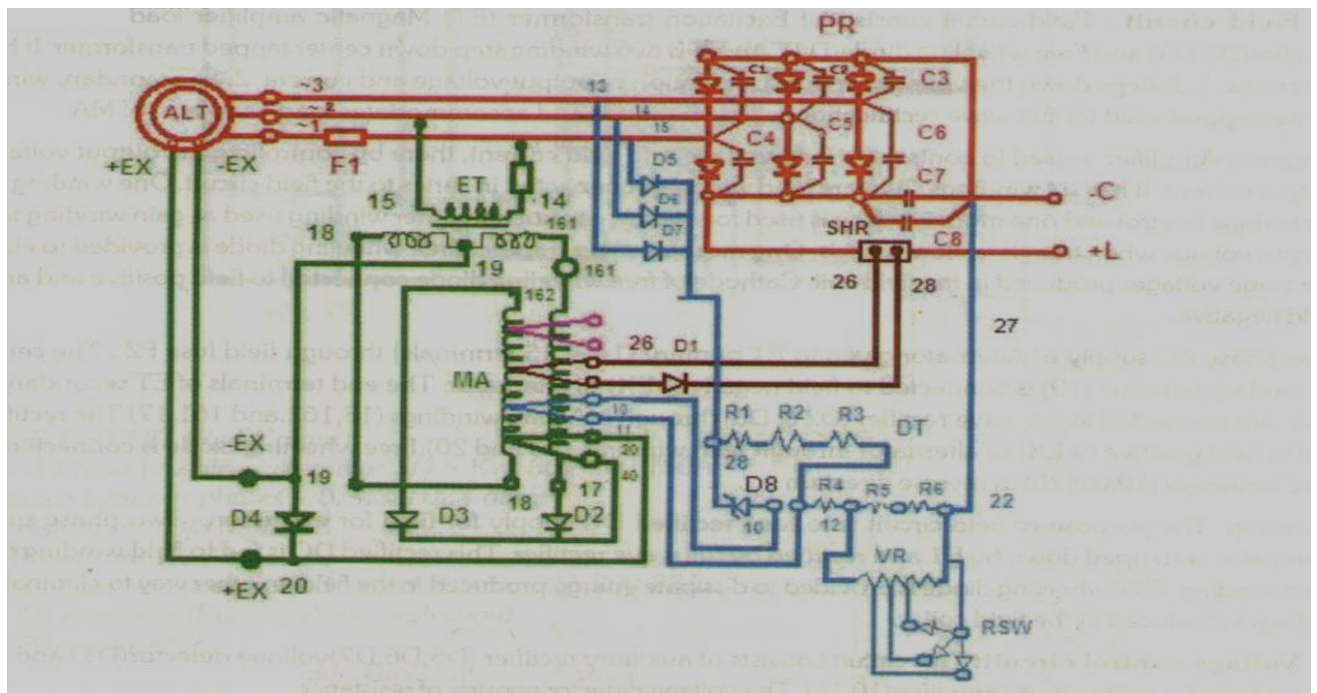
Ans:

- Provide alternator on the bogie.
- Provide axle pulley on the wheel.

- c) Provide 'V' belt of matching set between grade 48 & 52 on wheel axle, on which, the axle pulley is provided.
- d) After lowering and completion of buffer head adjustment of bogie, provide 'V' belts over alternator towards the axle pulley.
- e) After completion of provision of V belt, remove the split pin check nut and fixing nut of free end side tension rod spring tightening collar nut.
- f) Free the check nut and fixing nut of U clamp side of tension rod.
- g) Now insert the tension rod assembly between the bogie supporting bracket and eye (leg) of the alternator.
- h) Provide bolt for 'U' clamp of tension rod and eye of the alternator.
- i) Then slowly tighten the fixing nut (U clamp side) unit tension indicator match with the spring collar. This will give the correct tension of the V belt.
- j) Then provide fixing nut, check nut and split pin leaving a gap of 30 mm non AC coaches at free end side of tensioning for mechanism.
- k) Then observe the tension of belt with the help of 4Kg weight of the second belt from alternator, if the belt hangs completely below the straight line of adjacent belt the tension has to be increased. Repeat until the belt is lifted to the straight line of adjacent coach.

13) Explain working principle of KEL ALTERNATOR/REGULATORS 110 V, 4.5 K.W with the help of circuit diagram?

Ans:



For easy understanding of KEL 3 & 4.5KW 30 volts alternator/rectifier regulator circuit diagram, was divided into four sub circuits. They are

- (i) Power supply circuit
 - (ii) Field circuit
 - (iii) Voltage control circuit
 - (iv) Current control circuit
- a) **Power supply circuit:** This circuit consists of 3 phase alternator (ALT) & 3 phase bridge rectifier.(PR). Three phase AC supply (13,14,15 terminals) produced by alternator is fed to 3 phase bridge rectifier

consists of 6 silicon power diodes. The bridge is protected against voltage surges by 6 numbers of 0.25 mfd capacitors (C1 to C6), One 10 mfd capacitor (C7) and one 10000pf capacitor (C8) are provided across the bridge for filtering DC output and protection against high frequency surges respectively. Shunt (26 and 28) is provided in series to DC output voltage positive(+L) terminal, for sensing output current. DC output voltage terminals are(+L,-C)

Function: When the field coils are excited and rotor is rotated the variation in reluctance offered by the rotor teeth arrangement causes the flux produced by the field coil to pulsate. This pulsation of flux linked with Ac coils and induces e.m.f. in the AC windings. The induced E.M.F. in the 3 phase winding is rectified by the 3 phase bridge rectifier. The bridge rectifier also serves the purpose of maintaining the constant polarity in both the directions of the train and prevents current flowing from battery to alternator, when the coach is stable condition.

- b) **Field circuit:** Field circuit consists of Excitation transformer (ET) Magnetic amplifier(MA),. Field rectifier (D2,D3) and Freewheeling diode(D4). And ET is an auto step up centre tapped transformer. It has three functions. 1. It is auto transformer having one winding 2. It steps up the voltage for good regulation of output voltage and current. 3. Its secondary winding is centre tapped used for full wave rectification with two diodes and accommodates load windings of MA.

Magnetic Amplifier is used to control the field voltage and field current, there by controlling the output voltage and output current. It has six windings. Two are load windings connected in series to the field circuit. One winding is used for voltage control and one more winding is used for current control and other winding used as gain winding to boost output voltage when train is in slow speeds one more winding is spare. Freewheeling diode is provided to eliminate the surge voltage produced in the field coil. Cathode of freewheeling diode connected to field positive and anode to field negative.

Two phase AC supply of Alternator given to ET primary (14 & 15 terminals) through field fuse F2. The centre tap secondary terminals (19) are connected to field negative (-EX) of alternator. The end terminals of ET secondary (18 & 161) are connected to full wave rectifier (D2 & D3) through MA load windings (18,162 and 161, 17). The rectified DC fed to field positive (+EX) of alternator through gain winding. (40 and 20). Freewheeling diode is connected across field terminals (19 and 20) in reverse direction.

Function: The purpose of field circuit is to feed rectified DC supply for field for excitation. Two phase supply of alternator is stepped up by ET and rectified by full wave rectifier. This rectified DC is fed to field winding through gain winding. Free wheeling diode is provided to dissipate energy produced in the field, in other way to eliminate surge voltages produced in the field coil.

- c) **Voltage control circuit:** This circuit consists of auxiliary rectifier(RT)(D5,D6,D7), voltage detector(DT) and voltage control winding of magnetic amplifier(10,11). The voltage detector consists of resistance network (R1,R2,R3,R4) and zener diode D8, 1k potentiometer (RH) is connected across the resistance R4 to vary the output voltage settings. Voltage detector serves the purpose of providing DC signal to the control winding of MA.

Function: When the output voltage exceeds the present value, the drop across R1 is sufficient to conduct Zener diode and allows a DC signal to the voltage control winding of MA. The DC flux produced in control winding will oppose the AC flux of load winding and increases impedance of the field circuit. This increase of impedance, results in decrease of field voltage and field current there by decreasing output voltage. This process is continuous to maintain the output voltage constant. The voltage setting can be varied by varying the 1k potentiometer.

- d) **Current control circuit:** This circuit consist of shunt resistance (SHR 26,28 terminals) shunt diode(D1) and current control winding of M.A(26 and 27). For sensing output current, SHR is provided in the DC output voltage of alternator. Shunt leads are connected to MA current control winding through shunt diode.

Function: When preset value of current is supplied by the alternator exceeds, the voltage drop across the shunt is sufficient to conduct shunt diode. When shunt diode conducts, it sends a DC signal to current control windings of MA. This DC signal induces DC flux in the windings. This Dc flux opposes the AC flux of load windings and increases the impedance of the field circuit. Increase of impedance in field circuit reduces the field voltage and field current thereby decreasing the output voltage and output current. This process repeats when the output current exceeds and maintains the alternator current within preset limits. The current setting can be varied by varying the shunt resistance.

14) What are the safety precautions to be taken during work at IOH shed?

Ans: The following precautions has to be taken while working at IOH shed:-

- i. First obtain line block from guard or ASM.
- ii. Keep DANGER board on the top of the line.
- iii. Wear helmets with straps
- iv. Wear uniforms
- v. Wear industrial shoes
- vi. Always work under the supervision of a experienced supervisor/ technician.
- vii. Ensure all the cutouts / MCB's and other electrical safety equipments are not bypassed
- viii. Do not smoke at the IOH shed
- ix. Do not drink Alcohol at work
- x. Do not adopt short cut methods.
- xi. Do not spill oil/ grease on the floor
- xii. Always ensure availability of Fire Extinguishers near vicinity.
- xiii. Do not drop any metal on top of the battery.
- xiv. Use box type spanners while attending batteries.
- xv. Never bring a naked flame near battery.
- xvi. Do not remove/ replace connections in regulator box when supply is on.
- xvii. Do not try to remove v-belts when it is in tension.
- xviii. Disconnect supply in case of any fire.

15) Explain working principle of cells and what are the types of Batteries used in Indian Railways?

Ans: **Working Principal of Cells:** $\text{PbO}_2 + \text{Pb} + 2\text{H}_2\text{SO}_4 \leftrightarrow 2\text{PbSO}_4 + 2\text{H}_2\text{O}$

Discharging

PbO₂ on (+) plate and Pb on (-)ve plates are converted into lead sulphate. In this process, HSO is converted and water is formed. Consequently SPG of electrolyte falls and extents of fall is proportional to Ah taken out.

Charging:

The chemical process is reversed. PbSO₄ on positive plate is converted into PbO₂ (lead peroxide) and PbSo₄ on negative plate into Pb (spongy lead).H₂SO₄ is formed and water is consumed.SP.G of electrolyte rose.

Types of Batteries used in Indian Railway:

A. Lead Acid:

1. Conventional type
2. VRLA (Valve Regulated Lead Acid Batteries)
3. Low maintenance Batteries

B. Alkaline Batteries:

1. Nickel Cadmium
2. Silver Zinc

Constructional features:

- | | | |
|--------------------|--------------------|---------------|
| 1. Positive Plates | 2. Negative Plates | 3. Separators |
| 4. Container | 5. Cell cover | |

Accessories: a. Float b. Float guide c. Vent Plug

Capacities of Batteries

In train Lighting:

120 Ah-110V DC, Lead Acid & VRLA.

Part – B
(POWER)

I. SELECT THE CORRECT ANSWER:

- 1) Name of the meter used to measure Air velocity (b)

a. Multi meter	c. Thermometer
b. Anemometer	d. Ammeter
- 2) Name the Electrolyte used in lead acid cells (a)

a. Sulphuric Acid	c. Nitric acid
b. Hydrochloric Acid	d. Phosphoric Acid
- 3) Inverter converts (a)

a. DC to AC	c. AC to AC
b. DC to DC	d. AC to DC
- 4) Capacitor bank are used at substations to (c)

a. Avoid short-circuiting	c. Improve P.F
b. Improve load factor	d. Supply power in emergency
- 5) Circuit breaker is (a)

a. Current breaking device	c. Amplifier
b. Attention device	d. Starting device
- 6) PSI is the unit of (a)

a. Pressure	c. Humidity
b. Temperature	d. Velocity of gas
- 7) Rectifier converts (b)

a. DC to AC	c. AC to AC
b. AC to DC	d. DC to DC
- 8) Maximum permissible value of Earth Resistance for a small sub-stn? (c)

a. 0.5 Ω	c. 2.0 Ω
b. 1.0 Ω	d. 8.0 Ω
- 9) Medium Voltage is clarified as (d)

a. Less than 250V	c. Above 33KV
b. 650V to 33KV	d. 250V to 650V
- 10) Single Phasing preventer is used to prevent? (c)

a. Single Phase voltage	b. Three phase voltage
c. Motors from single phasing	d. Motor to start
- 11) What is the minimum safe value of insulation resistance for Motors? (a)

a. 10 M Ω	b. 15 M Ω
c. 5 M Ω	d. 20 M Ω
- 12) The dimensions of earth electrode? (b)

- a 3.0 mtr length x 40 mm dia x 3.2mm thick b 2.5 mtrs length x 50mm dia x 3.2mm thick y
- c 3.0 mtrs length x 50mm dia x 3.2mm thick d 2.5mtrs length x 40mm dia x 3.2mm thick
- 13) Earth Megger used (d)
- a To measure insulation resistance of cables b To measure voltage
- c To measure current d To measure insulation resistance of earth
- 14) Illumination levels measured by (a)
- a Lux Meter b Hydrometer
- c Anemometer c Multimeter
- A** **Generation, Transmission & Distribution of Electrical Energy**
- 15) The integration time employed by supply authorities for recording M.D. for a 33 kV/415 V, 10 MVA Sub-station is – (c)
- a 5 minutes b 15 minutes
- c 45 minutes d 60 minutes
- 16) While designing a sub-station anticipated future loads in the next.... Years are taken: (d)
- a 1 year b 2 years
- c 20 years d 5-7 years
- 17) As per the present Tariff the minimum power factor of sub-station should be (c)
- a 0.8 b 0.85
- c 0.98 d 0.95
- 18) The 3 phase voltage unbalance in supply should not exceed (a)
- a 2.5% to 5% b 20%
- c 25% d 10%
- 19) For maintaining power supply quality the rate of change of frequency should not exceed (c)
- a 5Hz/Sec b 10Hz/Sec
- c 1 HZ/Sec d 3 Hz/Sec.

II. BIT QUESTIONS:

- 1) 11 KV HT power supply is to be availed when the total load exceeds
a. 100 KW b. 1000KW **c. 75KW** d. 56KW
- 2) The voltage of 11 KV supply is
a. 11000V b. 1000V c. 100Vd. 33000V
- 3) The EHT power line crossing means.
a. Above 11KV **b. Above 33KV** c. Above 132KV d. Above 400KV
- 4) Guarding is required for the power line crossings of following Voltages.
a. Up to 11KV **b. Up to 33KV** c. Up to 132KV d. Above 132KV
- 5) Tender Notice is to be published for.
a. Limited tender b. Quotation c. Single tender **d. Open tender**
- 6) **Copper** is the good conductor of electricity.
- 7) Completion estimate is not **Required** for calling tender.
- 8) **Contingencies** charges means Transportation charges.
- 9) Detailed estimate is to be prepared for **sanctioned** works.
- 10) Detailed estimate needs **sanction** of HOD.

- 11) The fire extinguisher used for Electrical fire is **CO₂**
- 12) Fire is the combination of **material** and **temperature & Oxygen**.
- 13) **B** Type of fire extinguisher used to nullify the oil fires.
- 14) Electric type of fire is clarified as **D** type.
- 15) Ordinary fire can be extinguished by **water**.
- 16) Artificial respiration is required to the person met with **electrical** accident

III. INDICATE TRUE OR FALSE TO THE FOLLOWING:

- | | |
|---|--------------|
| 1) Without EMD the tender offer is valid. | False |
| 2) Amps is the unit of current | True |
| 3) Wood is the bad conductor of electricity | True |
| 4) AB Switch is used to break and make the power supply in OH Mains. | True |
| 5) Oil is used as a insulation in the power transformers. | False |
| 6) Finance vetting is required, if the cost of NS item exceeds Rs.1,00,000/- while procuring through COS. | True |
| 7) The Open tenders are to be opened in presence of a Accounts Office. | True |
| 8) Blue is the color of pure silica | True |

IV. OBJECTIVE TYPE:

Sl.No.	Item	To be filled	
1)	Transformer secondary volts	$= \frac{P.V.}{P.T.} \times (S.T.)$	(a) Primary Amps (b) Secondary Amps (c) Secondary Turns
		<u>Note:</u> PV: Primary Volts ST: Secondary Turns PT: Primary Turns	
2)	Minimum insulation value of transformer of 400V winding with 500V Megger is	2 M Ohms	(a) 2 M Ohms (b) 10 M Ohms (c) 50 M Ohms (d) 15 M Ohms
3)	Breather is packed with material	Silica Gel	(a) Silaca Jel (b) Oil 20 KV
4)	The minimum BDV of transformer Oil is	40 KV	(a) 40KV, (b) 50KV (c) 55 KV
5)	Earth fault relays providing against	Earth Fault	(a) Earth fault (b) Core beating (c) Full of oil level
6)	Over current relays providing against	Over current	(a) Over current (b) Over voltage (c) Earth fault
7)	MCCB is..... case circuit breaker	Moulded	(a) Miniature (b) Moulded

V. WRITE SHORT NOTES:**1) Why earthing is necessary for any electrical equipments, domestic installation & service building etc?**

Ans: To drain away any leakage of currents due to poor insulation and to save human life from dangerous shock and also to avoid burnt of electrical equipment.

2) What are Different type of earth conductor and sizes?

Ans: a) Copper plate electrode Minimum 60 cm X 60 cm X 3.15 mm
 b) Galvanized iron & steel plate electrode 60 cm X 60 cm X 6.3 mm
 c) G.I. Pipe electrode internal diameter 50 mm and length 2.5 Mtrs

3) Action to be taken if the resistance to earth of earth electrode is high?

Ans: Earth resistance depends upon soil conductivity. To reduce earth resistance dig around the earth electrode, clean all the rust around earth plate or pipe. Sprinkle the common salt dissolved water in the pit and pack it up with powdered coke & salt. If it is not possible provide additional earths and connects all the earth points in parallel by solid jumper connections.

4) What happens if electrical connection or electrical joint is loose?

Ans: due to loose connection at joints resistance at that point will increase thereby the I^2R losses are more and develops heat. The total wiring may burn.

5) Explain how to use Fire extinguisher practically?

Ans: a) Pull the pin at the top of the extinguisher.
 b) Aim the nozzle towards the base of the fire.
 c) Stand approximately 8 feet away from the fire and squeeze the handle to discharge the extinguisher.
 d) Sweep the nozzle back and forth at the base of the fire.

6) What are the precautions to be taken before starting work on electrical installations?

Ans: Before starting any electrical works on installations disconnect the power supply to the Electrical equipment and discharge & connect earth. Test with meters for any availability of supply then start the work.

7) Function of circuit – breaker, difference between 'isolator' and circuit breaker?

Ans: The function of circuit breaker is to break the electrical continuity in the event of faults duly isolating the faulty part. Isolator is switching device, which operates in OFF load only. Circuit Breaker is switching device, which can operate in, OFF or ON load.

8) If a feeder circuit-breaker trips, what action is required?

Ans: First isolate the faulty feeder check the faulty area on which fault the breaker was tripped (short circuit, open circuit and earth fault) after attending the faults test for its continuity and take insulation resistance of the feeder by using megger. And take the feeder into circuit.

9) Different types of low-tension fuses and high-tension fuses?

Ans: There are two types of fuses they are
 a) L.V Fuses - 1) Semi enclosed re-wirable fuses
 - 2) HRC cartridge fuses.

- b) H.V Fuses - 1) High voltage HRC fuses
- 2) Liquid type

10) Precautions to be taken in carrying out repairs on LT and HT switch gear?

Ans: The following precautions to be taken in carrying out repairs on LT & HT switch gears.

- a) Disconnect the power supply.
- b) Discharge the lines by connecting earth.
- c) Short the three phases with chain
- d) Start the work to carryout the repairs.

11) How do you measure the insulation resistance of transformer and what is the minimum value?

Ans: The insulation resistance of the transformer can be measured by using Megger and the minimum value of insulation resistance is 50 mega Ohm's.

12) Conditions for connecting two transformers in parallel?

Ans: a) Per unit impedance should be same
b) Voltage rating should be same
c) Phase sequence should be same.

13) What is the function of CT & P.T and where they are used?

Ans: The full form of CT is Current transformer and is used for measuring of current. The full form of PT is Potential transformer and is used to measure voltage.

14) Explain how to replace the HT Fuse on a 4-pole or 6-pole structure?

Ans: a) Open switch on 4-pole or 6-pole.
b) Connect the discharge rod between conductor and earth.
c) Replace the blown HT fuse.

15) What is the safety items kept in Sub-Station?

Ans: a) Discharge rod
b) Pair of gloves
c) Sand buckets
d) Fire extinguishers.
e) Safety belts and helmets
f) 3 phase shortening chains

16) What are the Duties of Sub-Station Operator?

Ans: Sub station operator is responsible for proper and safe operation of all electrical equipments in sub-station. He should write the hourly reading in log book. He should note any unusual occurrences. He should able to operate fire extinguisher in case of emergency. He should keep all tools, safety belts, testing equipments, etc., in good condition.

17) Describe procedure to take shut down and to test the power line before starting work?

Ans: Study the circuit and identify the circuit breaker to be opened. Open and lock the circuit breaker and keep the key in personnel custody. Disconnect neutral link if available. Hang "Man at Work" notice board on the circuit breaker. Test for supply after making sure that, the testing device itself is OK at the equipment or line. Start the work.

18) What are the types of Motors?

Ans: According the current there are two types of motors

- a) AC motors - 1) single-phase AC motors
- 2) 3-phase AC motors.
- b) DC motors - 1) shunt motors
- 2) Series motors
- 3) Compound motors.

19) What are the different types of starters?

- Ans; a) DOL starter
b) Star - Delta starter
c) Auto transformer starter
d) Rheo-static starter

20) How do you change the direction of rotation of a D.C. motor?

Ans: The direction of rotation of DC motor can be changed either by changing the field winding connections or by changing the armature winding connection.

21) Cause of sparking at the brushes of a DC Motor?

Ans: Sparking at the brushes may be occur due to poor quality of carbon brushes, poor armature, loose connection of carbon brush holder and loose spring tension.

22) How do you change the direction of rotation of 1 ϕ AC motor & 3 ϕ AC motor?

Ans: The direction of rotation of single-phase AC motor is changed by changing the capacitor connections from starting winding to running winding and vice versa. The direction of rotation of three-phase AC motor is changed by changing the phase sequence of three-phase supply.

23) If a single phase motor fails to start or run slow what action to be taken.

Ans: If it is not starting check the supply and test the winding if it found normal check capacitor.

24) Will a three-phase motor continue to run even if the fuse on one-phase is blown?

Ans: Yes it will be run but the motor will be getting heated up and chances of motor winding may be burnt.

25) During run if a motor is getting unduly hot, what should be the reason?

Ans: The motor may be overloaded or bearing may be defective.

26) What is a CLS panel? Briefly explain its functioning?

Ans: A CLS (Colour Light Signaling) panel is a power control unit which primarily extends the power supply to signaling system. The CLS panel is provided in Electrified section of Railway line, where power supply from 25KV OHE which is most reliable is tapped and stepped down by auxiliary transformers to 230V AC single phase. The power supply thus obtained from UP/DN OHE lines and also the local power supply is fed to CLS panel, which automatically/manually senses the healthy power and feeds to the signaling system.

27) What is power factor? List the disadvantages of lower power factor? How to improve power factor? Mention the formula for required KVAR to improve power factor?

Ans: The ratio of useful power (KW) to apparent power (KVA) is termed as power factor. The power factor indicates the portion of the current in the system performing useful work. The power factor of Unity denotes 100% utilization of the total current.

The disadvantages of lower power factors are:

- (i) Over loading of cables & transformers.
- (ii) Drop in voltage at load points.
- (iii) In-efficient operation of plants and
- (iv) Attraction of penalty from power supplies companies.

The best way of improving power factor by installing suitable rating static power capacitors preferably at load points.

$$\text{kVAR} = \text{kW} (\tan \phi_1 - \tan \phi_2)$$

28) What is the objective of Indian Electricity Act-2013?

Ans: The main objectives of Indian Electricity Act-2013 are:

- (i) To consolidate the laws relating to generation, transmission, distribution, trading and use of electricity.
- (ii) Taking measures to conducive to development of electric industry and promoting competition. Therein, protecting interests of consumers including supply of electricity to all areas.
- (iii) Rationalization of electricity tariff, ensuring transparent policies regarding subsidies.
- (iv) Promotion of efficient and environmentally being policies.
- (v) Constitution of central electricity authority regulatory commission and establishment of appellate tribunal.

29) What are the illumination levels to be maintained at A1, A & B stations?

Ans:

S.No	Location	Approved Lux Levels for different category of stations	
		A1/A	B/C
	Category of Station		
1	Concourse	150	100
2	Circulating Area	50	30
3	Waiting Hall	150	100
4	Retiring Room	100	100
5	Platform		
	a. Open	50	30
	b. Covered	150	100
6	Enquiry cum Reservation office.		
	a. General	150	100
	b. Counter	150	150
7	Covered Passenger Way		
	a. Corridors	50	50
	b.FOB	50	50
	c. Stairs	50	50
8	Parcel/luggage office		
	a. General	100	100

	b. Counter	150	150
9	Timer Table	200	200
10	Outdoor car parking	50	30
11	Restaurant Area		
	a. Kitchen	200	150
	b. Stores	150	100
	c. Dining Hall	200	150
12	Other Service building at Station	200	200
13	Cloak Room		
	a. General	100	100
	b. Counter	150	150
14	Public Utility Services (Toilet/Bathroom)	100	75

30) What are the essential equipments to be maintained in ART & MRV?

Ans: Electrical equipments in ART/MRV available as per Railway Board's Lr. No.99/Elec/G/113/1, dtd.16-07-03.

S. No.	Equipment	Proposed to be Modified	
		ARTs (Class A/Class B)	ARMES (class C)
1	Diesel generating set of 15 KVA 230 V Capacity *	1 Set	--
2	Generator set Kerosene driven 1.5 KVA 230 V.	20Sets	2 sets
3	Complete luminar fitting with 1000 W Halogen lamps and control gear	10Sets	2 sets
4	Complete luminar fitting with 150 W Metal Halide lamp and control gear	40Sets	10 sets
5	Telescopic stand 2 Mts high for mounting luminars for Halogen/MH fittings.	20 Nos	--
6	PVC insulated and PVC sheathed 3 Core flexible cables 23/0.193 mm 15 m long with 15 weather proof IC pin for weather proof I.C. socket.	50 nos	12 nos
7	PVC insulated and PVC sheathed 3 Core flexible cable 23/0.193 mm	1500 mtrs	300 mtrs
8	K. Oil in 200 Lts capacity drums.	3 nos	1 no
9	Diesel oil in 200 Lts drums	1 no	--
10	Polythene containers 20 Lts capacity for handling kerosene and pouring into auxiliary tanks of engine	18 nos	4 nos
11	Lubricating Oil	40 ltrs	5 ltrs
12	Oil measuring can 1 Litre capacity	6 nos	1 no
13	Insulation tape PVC in rolls of 10 mts.	24 nos	6 nos
14	Tool set comprising of 1 no. cutting plier (254 mm), 3 no's of screw driver (round of 300 mm, 150 mm & 100 mm), 1 no. Knife and 1 no. hammer DP.	1 set	1 set
15	Spanner DE 3m to 19mm in steps of 1.5mm	1 set	1 set
16	Socket spanner with lever 3 mm to 19 mm	1 set	1 set
17	Aluminum telescopic ladder	2 nos	--

18	Earthing rod for earthing OHE **	2 nos	--
19	Portable switch board with water proof sockets each capable of taking 500 watt load (2 sockets of 5 Amps and 2 combination sockets of 5/15 amps)	4 sets	1 set
20	Drum of fixed stand for main cable	2 nos	--
21	Battery charger 230 V AC/110 DC , 60 Amps	2 nos	--
22	100 W Gas filled bulbs bayonet type along with holder in wire cage and with handle and hook	6 nos	4 nos
23	Telescopic masts 6 meters high	4 nos	2 nos

Note: - To avoid premature replacement of existing 6 KVA D.G. set, the existing 6KVA DG set should only be replaced by 15 KVA D.G. set when it is due for replacement.

All new ART's shall be equipped with 15 KVA D.G. set.

** To be provided on Electrified Section only.

31) What are the precautions to be taken while working in RE area?

Ans: No one shall attempt to work on any overhead line running alongside the electrified tracks without taking special precautions of earthing on both sides of the work.
Minimum 2m electrical clearance from live OHE of the adjacent track or any other equipment nearby must be maintained.
During foggy/cloudy weather conditions, wear safety shoes, insulated rubber gloves and tools with insulated handles should be used to protect from induction effect.
Steel tape or metallic tape or tape with woven metal reinforcement should not be used.
Always carry the ladders/lengthy items in horizontal position instead of vertical.
While attending to platform lights (in COP/OPEN area), the ladders shall be properly secured to avoid accidental fall in OHE.

- 32) What are the factors to be taken into consideration while selecting a pump for a particular location/purpose?
- 33) What are the changes taken place to DISCOM billing system recently?
- 34) What are the factors/items to be checked in DISCOM bill to reduce the billing amount? What are suggestions/remedies you propose to reduce billing amount?
- 35) Mentioned 2 types of renewable Energy Sources as alternatives to DISCOM Power supply?
- 36) What are the major parts in Solar Lighting Systems?
- 37) Mentioned few Energy Conservation Measures in water pumping system?
- 38) What Energy Auditing? What are the advantages in conducting Energy Auditing?
- 39) What is the purpose of EOCR in pump starter? What are the factors to be taken into consideration to select range of EOCR?
- 40) What are the probable reasons for failure/burning of submersible pumps?
Or
What are the items to be checked to find out the reasons for any pump burning?
- 41) What are the items to be checked and maintained in LC Gates before GM's Annual Inspection?

VI. DESCRIPTIVE TYPE QUESTIONS:

- 1) List out the various types of Maintenance schedules for Equipment used in Power Maintenance?
- 2) Explain the following Schedule Maintenance
A Fortnightly of CLS Panel

- B Yearly of Sub-Station
- C Quarterly of Pumps
- D Yearly of D.G.Sets
- E Half Yearly of Earth Electrode
- f Yearly of Transformers
- g Monthly of AC (split & Window)
- h Monthly of Water coolers
- I Monthly of Solar Geyser

- 3) Design & List out the materials required for Electrification of the following:
 - a LC Gate including Road lighting
 - b Dy.SS Room
 - c VIP Lounge at station
 - d ORH (Double bed room)
 - e Booking Office at 'B' Class
 - f Running Room 6 beds.
- 4) Define the Energy Audit and Conduct the Energy Audit of
 - a Sanchalan Bhavan
 - b Any Coaching Depot
 - c Hospital
- 5) What are the Energy Conservation measures to be adopted at home and work place?
- 6) Explain Procedure for working on 11KV OH Lines?
- 7) What are the Safety measures to be adopted for
 - (i) Working on (11KV) HT installations.
 - (ii) Working in the Vicinity of 25KV OH traction line.
- 8) What are the Fire Prevention measures to be adopted for –
 - i) Transformers
 - ii) Batteries
 and also Internal wiring of -
 - a) Air-conditioners
 - b) Switch Boards
 - c) SDB's
- 9) Explain how the efficiency of Pumps is measured.
- 10) What are the major parameters to be observed in OH Power line crossings?
- 11) Explain the procedure for taking a person on IOD?
- 12) What are the various types of electrical accidents and explain the preliminary First aid to be given in case of Electrical accidents.
- 13) What are the requirements and tests for obtaining EIG approval of a newly erected 11KV sub. Station of 250 KVA capacity?
- 14) What are the Electrical Safety precautions to be taken at home, workplace and surroundings?
- 15) What are the activities carried out by SC Division during Energy Conservation Week of 14th Dec – 21st Dec 2011?
- 16) Explain -
 - (1) SOB
 - (2) Technical Circular
 - (3) Safety Circular
 - (4) AC Message
 - (5) Safety Meeting

- 17) Explain the precautions to be taken while recording measurements for contract works?
- 18) What are the documents proforma to be attached with Joint Measurements of contractor works? Explain briefly about out each one of them/
- 19) What are the Points to be noted while placing of indents and passing of materials and bills as circulated by Sr.DEE/M/SC.

VII. PROBLEMS:

- 1) **An inductive circuit has a resistance of 2.0 Ohms in series with an inductance of 0.015 henry? Find (a) Current (b) power Factor (c) Power consumed? When connected across 200 Volts, 50 Hz. Supply mains?**

Ans Given data

$$R = 2.0 \text{ Ohms, } L = 0.015$$

$$V = 200V, \quad f = 50 \text{ Hz.}$$

Formula used

$$Z = \sqrt{R^2 + X_L^2}$$

$$X_L = 2\pi f L$$

$$I = \frac{V}{Z}$$

$$P.F = \frac{R}{Z}$$

$$\text{Power} = VI \cos \phi \text{ (P.F)}$$

$$X_L = 2\pi \times 50 \times 0.015 = 4.714 \text{ Ohms.}$$

$$Z = \sqrt{(2)^2 + (4.714)^2}$$

$$= \sqrt{26.22} = 5.121 \text{ Ohms.}$$

(a) $I = V/Z = 200/5.121 = 39.05 \text{ Amps.}$

(b) $\text{Power Factor} = \frac{R}{Z} = \frac{2}{5.121} = 0.39$

(c) $\text{Power Consumed } P = VI \cos \phi$

$$= 200 \times 39.05 \times 0.39$$

$$= 3045.9 \text{ Watts.}$$

- 2) **Calculate the Line and Phase current of AC, 3 phase, 400 Volts, 7.5 B.H.P.? Motor with a power factor of 0.8 and efficiency 90%, when the winding is connected (a) in star (b) in Delta?**

Ans Given Data

$$V_L = 400 \text{ Volts, 3 Phase}$$

$$\text{BHP} = 7.5, \text{ P.F} = 0.8$$

$$\eta = 90\%$$

Formula used -

$$\text{Efficiency } \eta = \frac{\text{Output}}{\text{Input}} \text{ or } \text{Input} = \frac{\text{Output}}{\eta}$$

$$\text{Power } P = \sqrt{3} V_L I_L \cos \phi$$

$$\text{BHP} = 7.5 \times 746 \text{ Watts.}$$

$$= 5595 \text{ Watts.}$$

$$\text{Input (P)} = \frac{\text{Output}}{\eta} = \frac{5595}{0.9}$$

$$P = 6216.66 \text{ Watts.}$$

$$P = \sqrt{3} V_L I_L \cos \phi$$

$$6216.66 = \sqrt{3} \times 400 \times I_L \times 0.8$$

$$I_L = \underline{6216.66}$$

$$\sqrt{3 \times 400 \times I_L \times 0.8}$$

$$I_L = 11.2 \text{ Amps.}$$

(a) In star Line current = Phase current

$$\text{Therefore } I_{ph} = 11.2 \text{ Amps.}$$

(b) In Delta Phase current

$$I_{ph} = I_L / \sqrt{3} = 11.2 / \sqrt{3} = 6.4 \text{ Amps.}$$

3) **A 250 KVA, 11000/400 Volts Delta / Star 3 phase transformer has load of 100 Amps. Find the line current on primary?**

Ans Given Data

$$\text{Primary Voltage } V_p = 11000 \text{ Volts}$$

$$\text{Secondary Voltage } V_s = 440 / \sqrt{3} \text{ (Since star connected)}$$

$$\text{Secondary Voltage } I_s = 100 \text{ Amps.}$$

$$\text{Power} = 250,000 \text{ VA}$$

$$\text{Formula : } V_s / I_s = I_p / I_s$$

$$\frac{440 / \sqrt{3}}{11,000} = \frac{I_p}{400}$$

$$\frac{440 / \sqrt{3}}{11,000} \times 100 = \frac{40}{11 \times \sqrt{3}}$$

$$= 2.09 \text{ Amp.}$$

4) **Find the diameter of copper wire in mm, if the resistance of 1.5 Kilometer wire is 7.2 Ohms? (Specific Resistance of copper is $1.7 \times 10^{-6} \text{ Ohm/cm}^3$)**

Ans Given Data

$$\text{Length} = 1.5 \text{ Km}$$

$$= 15,000 \text{ cm}$$

$$\text{Resistance} = 7.2 \text{ Ohms.}$$

$$\rho = \frac{1.7}{10^6} = 1.7 \times 10^{-6}$$

$$\text{We Know } R = \rho L/a$$

$$7.2 = 1.7 \times 10^{-6} \times 15,000 / a$$

$$a = 1.7 / 1,00,000 \times 15,000 / 7.2$$

$$= 0.035 \text{ sq.cm.}$$

$$\text{Now } a = \pi d^2 / 4$$

$$0.035 = \pi / 4 \times (d)^2$$

$$d = \sqrt{\frac{0.035 \times 4}{\pi}} = 0.21 \text{ cm.}$$

5) **Find the capacity of pump (HP) to pump the water at the rate of 20 Gallons per minute, from the bore well of 250 ft. depth to the over head tank of height 100 ft. Neglect all friction losses. Take specific gravity of the water as '1' and take efficiency of the pumps as 60%?**

Ans: Given Data

$$\text{Discharge (Q)} = 20 \text{ Gallons per minutes (GPM)}$$

$$\text{Depth of bore well} = 250 \text{ ft.}$$

$$\text{Height of the water tank} = 100 \text{ ft.}$$

$$\text{Specific gravity of water (S.G)} = 1.0$$

$$\text{Efficiency of the pump } (\eta) = 60\% = 0.6$$

$$\text{Pump capacity in Horse Power(HP)} = \frac{Q \times \text{Head} \times \text{Specific Gravity}}{3960 \times \eta}$$

Total Head = Depth of bore well + Height of the Tank

(in feet) = 250 + 100 = 350 Feet.

$$\begin{aligned}\text{Pump Capacity in HP} &= \frac{Q \times \text{Head} \times \text{Specific Gravity}}{3960 \times \eta} \\ &= \frac{20 \times 350 \times 1.0}{3960 \times 0.6}\end{aligned}$$

PART – C (OFFICIAL LANGUAGE ACT AND RULES)

I. OBJECTIVE:

1. In terms of Article 343 (1) of the Constitution of India _____ Language in _____ Script shall be the Official language of the Union. (**Hindi, Devanagari**)
2. Article 343(2) of the Constitution of India empowers to authorize use of Hindi and _____ numerals in addition English (**International form of Indian numerals**).
3. The Official Language Act was passed in _____ (Yr. 1963)
4. According to Official Language Rules, India is divided into _____ regions and they are _____, _____ and _____ (**3 A, B and C**)
5. States that come under _____ region are Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Rajasthan, Uttar Pradesh, New Delhi. (**A**)
6. The States that come under Region _____ are Gujarat, Maharashtra, Punjab, Andaman Nicobar, Chandigarh (**B**)
States Other than mentioned under the categories A and B, come under Region
Non-Hindi speaking states come under _____ Region. (**C**)
8. Target for Originating Correspondence from C to A, B and C Regions _____ % (**55%**).
9. A cash Award of Rs. _____ is given under Railway Minister's Rajbhasha Shield (**7000/-**).
10. Communications from Central Government Offices to the States, Offices and persons in _____ region shall be in Hindi, and if it is in English, a Hindi translation shall accompany. (**A**)
11. Communications from Central Govt. Offices to States or Offices in _____ Region shall be in Hindi, and if it is in English, Hindi translation shall accompany (**A**).
12. Communications from Central Govt. Offices to persons in Region B shall be in ____ (**Hindi**)
13. Communications from Central Government Offices to States or Persons in Region C shall be in _____ (**Hindi/English**)
14. Communications between Central Government Offices _____ between one Ministry or Department and another may be in _____ (**Hindi/English**).
15. Communications between Central Government Offices _____ between one Ministry or Department and attached/subordinate offices in Region A may be in _____ depending on number of persons having another may be in ____ (**Hindi**)
16. Communications between Central Govt. Offices in Region A shall be in ____ (**Hindi**)
17. Communications between Central Govt. Offices in Region B or C may be in _____ (**Hindi or English**)
18. Translations of such communication shall be provided along with the communication where it is addressed to Offices in _____ (**C region**)

- 19 Representations may be submitted by an employee in _____ (Hindi).
- 20 Representations, when made/signed in Hindi shall be replied to in _____ (Hindi)
- 21 Notings in Central Government Offices may be made by an employee in _____ and no _____ be required to furnish a translation of it. (Hindi only, translation)
- 22 If an employee has working knowledge of Hindi, he will not ask for English translation of a Hindi document, unless it is of _____ nature. (Technical)
- 23 Manuals, Codes, Forms, Notices etc. shall be printed or cyclostyled in _____ form (Hindi/English diglot form).
- 24 The forms and heading on registers shall be in _____ (bilingual form)
- 25 All name plates, sign boards, letter heads, inscriptions on envelopes and other stationery etc. shall be in _____ (Bilingual form).
- 26 Responsibility for compliance of the Official Language Rules shall be that of (Administrative Head/Head of the Office).
- 27 Andhra Pradesh and Kerala states come under _____ Region (C)

II. Questions and Answers:

Q.1. Why is Hindi divas celebrated and When? Or What is importance of Hindi Divas?

Ans: 14th September is celebrated as Hindi Day because the Constituent Assembly of India had adopted in Devanagari Script as the Official Language of the Union on 14th September 1949.

Q.2 What are Documents to be issued in Hindi-English bilingual form under Section 3(3) of OL Act, 1963?

Ans The following documents have to be issued in Hindi-English bilingual form simultaneously

- (i) Resolutions, general orders, Rules, Notifications, Administrative reports or other reports or Press communiqués.
- (ii) Administrative and other Reports and Official Papers lay before a House or the Houses of the Parliament.
- (iii) Contracts and agreements executed and licenses permits, notices and forms tender issued.

Q.3 How many members are in parliamentary Committee of Official Language and how they are elected?

Ans The Committee consists of thirty members, out of them twenty members shall be from the House of the People (LOK SABHA) and ten shall be from the council of states (RAJYA SABHA). They are elected respectively by the members of the house of people and the members of the Council of States in accordance with the system of proportional representation by means of the single transferable vote system.

Q.4 What are provision of OL Act, 1963 that are not applicable to Jammu and Kashmir?

Ans: The provisions of section 6 and section 7 shall not apply to the state of Jammu and Kashmir.

Q.5 What do you mean by proficiency in Hindi?

Ans: A Government servant who have studied SSLC/SSC/Matric or equivalent in Hindi Medium.

or Studied Hindi as an optional subject in Inter or Degree or at higher level. Passed SSC/Matric with Hindi as language with minimum pass marks.

Q.6 What do you mean by working knowledge in Hindi?

Ans: A Govt. employee who have studied Hindi as a Second Language/Third Language in SSLC/SSC/Matric or equivalent or Inter/Degree or Passed Hindi Pragya examination or prescribed Hindi Dept. Exam (i.e. Prabodh or Praveen)

Q.7 Who is responsible for use of Hindi or English for issuance of documents comes under Section 3(3)?

Ans: Both Hindi and English shall be used for all documents referred to in sub section (3) of section 3 of OL Act. 1963 and it shall be the responsibility of persons signing such documents to ensure that such documents are made, executed or issued both Hindi and English.

Q.8 Can any Govt. servant write notes etc. in Hindi only?

Ans: Yes, As per Rule No.8 of OL Rules, 1976, an employee may record a note or minute on a file in Hindi or in English without being himself required to furnish a translation there of in the other language.

Q.9 Who is responsible to implement the Hindi in Govt. Offices?

Ans: It shall be the responsibility of the administrative head of each Central Govt. Office to implement official language Hindi in their offices.

**PART – D
(ESTABLISHMENT, STORES & GENERAL QUESTIONS)**

I. OBJECTIVE:

Ranker Section – B Question Bank – General (Common to all Trades)

Each question carries one mark.

- 1) Chief Electrical Engineer is the Electrical head of the South Central Railway.
- 2) The full form of CESE is Chief Electrical Service Engineer
- 3) Inventory can be in the form of Raw materials, supplies, in process goods .
- 4) In computer terminology, LAN stands for Local area network.
- 5) I.R.S stands for Indian Railway standard.
- 6) 21 languages are recognized by the eighth schedule
- 7) On passing of which examination conducted by the Hindi Training Scheme, Personal pay will be given Pragya.
- 8) Metal Token pass issued to Officers.
- 9) Maternity leave can be granted for a maximum period of 180 Days.
- 10) Maximum LHAP that can be granted at one time 24 Months.
- 11) RDSO stands for Research, Design and Standards Organisation.
- 12) RDSO located at Lucknow.
- 13) An employee can be deemed suspended, if he is detained in custody for more than 48 hrs reviewed
- 14) According to D and AR, commission means UPSC.

- 15) Railway Board located at New Delhi
- 16) Women employees having two minor children may be granted child care leave for a maximum period of 730 days during their entire service.
- 17) Rejected saleable scrap should be sent to Scrap Depot, Lallaguda.
- 18) Dismissal is a more serious punishment.
- 19) PHOD stands for Principle Head of the department.
- 20) Extraordinary leave can be granted in combination with other leaves except CL.
- 21) PHOD of the Electrical Department CEE.
- 22) During Hospital leave full salary is granted for a period of 120 days.
- 23) During Special Disability leave full salary is granted for a period of 120 days.
- 24) Head quarters of South Central Railway is located at Secunderabad.
- 25) SCR stands for South Central Railway.
- 26) Following leaves can be granted in combination LAP+LHAP+ Commuted leave.
- 27) For donation of blood one day Special Casual Leave.
- 28) Decode COFMOW Central Organisation for Modernization of Workshops.
- 29) Compulsory retirement is a Major penalty.
- 30) ISO stands for Institute of Science and Ocean studies.
- 31) EMS stands for Environmental Management system.
- 32) ISO 9000 Series deals with QMS.
- 33) ISO 14000 Series deals with EMS.
- 34) S1302A indent will be generated, when the value of material is more than Rs. 10,000/-.
- 35) With holding of the Privilege Passes or Privilege ticket order or both is a Minor penalty.
- 36) Rs. 2800/- is the grade pay of Technician –I
- 37) Paternity leave can be granted for a maximum period of 15 days.
- 38) Periodicity for checking the fire extinguisher 3 months.
- 39) The term CCA stands for city compensatory allowance.
- 40) Leave cannot be claimed as a matter of right.
- 41) The leave sanctioning authority may refuse or revoke of any kind of leave.
- 42) The leave sanctioning authority cannot alter the kind of leave due and applied for.
- 43) LAP can be accumulated up to maxim of 300 days.
- 44) Commuted leave not exceeding half the amount of half pay leave due can be taken on medical certificate.
- 45) Leave not due during the entire service is limited to maximum of 360 days.
- 46) The duration of maternity leave is for 135 days.
- 47) ISO 9000 Series deals with QMS
- 48) ISO 14000 Series deals with EMS
- 49) ISO 18001 Series deals with OHSAS
- 50) If attempts are made to make an instrument very sensitive, quality is likely to be impaired is precision.
- 51) In computer terminology, ID address is computer address
- 52) In computer terminology, IP stands for Internet protocol
- 53) In computer terminology, ORACLE is a Database.
- 54) Hospital leave can be granted for a maximum period of 28 months.
- 55) In computer terminology, LAN stands for local area network.
- 56) In computer terminology, HTTP is an Protocol.
- 57) I.R.S stands for Indian Railway standard.
- 58) In computer terminology, IDE is related to HDD.
- 59) How many languages are recognized by the eighth schedule 21.
- 60) In computer terminology, Modem is a Analog to Digital / Digital to Analog converter.
- 61) Rail wheel factory located at Yelahanka, Bangalore.

- 62) In computer terminology, ISP is a service provider.
- 63) In computer terminology, MB stands for mega bytes.
- 64) In computer terminology, NTFS is a file system.
- 65) In computer terminology, One kilo byte is equal to 1024 bites.
- 66) In computer terminology, 80386 Processor is a 32 bit microprocessor chip used in personal computers.
- 67) In computer terminology, Gateway in computers A device that connects dissimilar networks.
- 68) Leave not due shall not be granted in case of leave preparatory.w
- 69) LHAP can be converted in half period of leave on an average pay on medical grounds is called commuted leave..
- 70) Action to eliminate the cause of a detected non conformity is Corrective action.
- 71) Meeting of PREM committee at Railway board, zonal Railway and Divisional Railway level will a quarter.
- 72) RWF stands for Rail wheel factory.
- 73) In computer terminology, ISP stands for Internet service provide.
- 74) Gear tooth vernier is used to measure pitch line thickness of gear.
- 75) Accuracy is agreement of the result of a measurement with the true value of the measure quantity.
- 76) Acronym of LHB Linke Hoffman Bosch.
- 77) In computer terminology, AGP stands for Advanced graphics port.
- 78) An abbreviation made up of the first letters of a series of words is called acronym.
- 79) In computer terminology, Bluetooth is a communication device.
- 80) Censure is a Minor penalty C.
- 81) House rent allowance for 'X' classified cities is 30% of basic pay.
- 82) House rent allowance for 'Y' classified cities is 20% of basic pay.
- 83) House rent allowance for 'Z' classified cities is 10% of basic pay.
- 84) For the purpose of HRA Hyderabad is 'X' classified city.
- 85) For the purpose of HRA Warangal is 'Y' classified city.
- 86) For the purpose of HRA Tirupathi is 'Z' classified city.
- 87) In computer terminology, a CD-R drive that can read CDs.
- 88) In computer terminology, a CD drive that can read, write, and the rewrite CDs CD-RW drive.
- 89) In computer terminology, A high-capacity disc that uses optical technology to store data in a form that can be read but not written over CD-ROM.
- 90) A non railway official can assist 3 D and AR cases at most.
- 91) A photo electric device in which the resistance of the metal changes directly proportional to the light striking on it, is called photo conductive cell.
- 92) A tooth paste tube can be produced by hollow backward extrusion.
- 93) In Electronics terminology, DTS is related to sound system.
- 94) In computer terminology, DVD stands for Digital versatile disk.
- 95) Email address uses @ symbol.
- 96) For P.N.M. meeting's agenda should be submitted by the union for discussion¹ before 2 days in advance of Schedule date of meeting.
- 97) CAMTECH located at Gwalior.
- 98) Errors which are regularly repetitive in nature are systematic errors.
- 99) In computer terminology, DOS stands for disk operating system.
- 100) Expand the term CAMTECH centre for advanced maintenance technology.
- 101) In computer terminology, DNS stands for domain name system.
- 102) In computer terminology, CPU stands for central processing uni
- 103) D and AR formed in the year 1968.

- 104) In computer terminology, data transmission is measured in bits/s.
- 105) Optical flats are made of quartz.
- 106) 3000/- will be given for festival advance.
- 107) 3000/- will be given for Cycle advance.
- 108) In computer terminology, key board is the input device of PC.
- 109) In computer terminology, CPU is the out put device of PC.
- 110) With holding of privilege pass for 10 years is minor penalty
- 111) With holding of the Privilege Passes or Privilege ticket order or both is a Minor penalty
- 112) In Computer terminology, RED HAT is related to LINUX.
- 113) Reduction to lower stage in time scale of pay by one stage for a period exceeding three year is a major
- 114) Reduction to lower stage in time scale of pay by one stage for a period not exceeding three year is a minor penalty
- 115) In computer terminology, RAM stands for random access memory
- 116) The D and A rules are derived from 309 article of Indian constitution.
- 117) Festival advance can be recovered in ...10.... equal instalments.
- 118) PEASD stands for Passenger emergency alarm signal device
- 119) PEAV stands for Passenger Emergency alarm valve
- 120) On motor cycle advance, interest can be recovered
- 121) Dy.CMM/M&E/LGD can recouped the stock items value up to Two Lakhs through local purchase
- 122) TRD stands for Traction distribution
- 123) UPS stands for uninterruptible power supply
- 124) A railway servant shall be permitted to encash leave on average pay upto 10 days
- 125) For availing encashment leave ...30..... days of leave on average pay should be available to employee's credit after taking into account the period of encashment as well as leave availed of.
- 126) The total leave so encashed on average pay during the entire career shall not exceed ...60..... days
- 127) Expand RELHS Retired Railway Employees Liberalised Health scheme
- 128) How many berths available in AC two tier coach 48
- 129) What is RSP rolling stock programme.
- 130) How many clauses are there in ISO 9001:2000(E) quality system 8
- 131) What is the **maximum** speed of Duranto Express 160 Kmph
- 132) The number of slip gauges in a set are 103
- 133) The retired railway servant can hold not more than seven D and AR cases in his hand to act as defence helper.

II. QUESTION & ANSWERS:

Q.1 What is Honorarium?

Ans: Honorarium is a remuneration for work performed which is occasional or intermittent in character and either so laborious or of such special merit on to justify a special reward.

Q.2 What is substantive Pay?

Ans: Substantive pay means the pay other than special pay, personal pay or emoluments classified as pay by the President under Rule 1303(iii) to which Railway Servant is entitled on account of post to which he has been appointed substantively or by reasons of his substantive position in a cadre.

Q.3 What is meaning of "Officiating"?

Ans: Officiating Means the Railway Servant officiate in a post where he performs the duties of a post on which any other person holds a lien or when a competent authority appoints him to officiate in a vacant post on which no other railway servant holds lien.

Q.4 What is LDCE?

Ans: Limited Departmental Competitive Examination. In Civil, Electrical, Mechanical, S&T Dep. 25% of Vacancies are filled by this minimum pass Marks are 60%.

Q.5 What is Dearness Allowance?

Ans: Dearness Allowance is in the nature of compensation for Established increase in the cost of living and comprised of Dearness Allowance, Additional Dearness Allowance and Dearness Pay as the Government may from time to time decide.

Q.6 Which are the allowances are exempted from the income tax?

Ans:

1. Sumptuary Allowance and uniform Allowance
2. Death cum Retirement gratuity received by Government Servant their families.
3. Gratuity received by an employee
4. Any payment in commutation of pension.
5. Amount by way of encashment of unutilized earned leave.
6. Any some received under life insurance policy.

Q.7 Elaborate Vigilance Organization and what is Central Vigilance Commission Act 2003?

Ans: Vigilance implies a state of being watchful or on the alert. There is a Chief Vigilance commission for all Central Government Ministries and departments. Indian Railway had set up a Vigilance unit under a under Control of Sr.,Dy. ,GM on Zonal Railways. CVC ACT, 2003 Mandates - the Central Vigilance Commission to enquire or cause an enquiry into complaints against public servants wherein allegations of corruption are involved. The commission can cause an enquiry through the Chief Vigilance Officer of the Organization concerned or CBI or any other anti-corruption investigating agency under the Government of India.

Q.8 What is Arbitration?

Ans: Arbitration is a device for setting up difference between the Railway Administration and contractor by intervention of third person without the help of Court of Laws. Under the procedure the contractor may call for arbitration after 90 days of his presentation of final claim on disputed matter. There would be two Arbitration and also umpire over them. Arbitrators are appointed by General Manager.

Q.9 What are the objectives of PREM?

Ans: The broad objectives of PREM are :

1. evaluate the functioning of the Railways and exchange date and ideas on way and means of improving the efficiency and viability of the enterprise
2. to facilitate effective and meaningful participation of the Railway employees in the management process.
3. to discuss and identify the measures for improving the quality of service in the rail passengers and safety operations.

Q.10 What is Trade Union Act 1926?

Ans: The Act provides for Registration of Trade Unions. It clarifies privileges of Registered Trade Unions and Rules.

Q.11 What is a tribunal and purpose of CAT.?

Ans: It is a forum appointed by a statute having powers to all adjudicate on the matter falling within its jurisdiction. The Central Government has Established. Administrative tribunals with effect from Nov. 1st 1985.

Purpose: Speedy and inexpensive adjudication or trial of disputes or complaints regarding recruitment and conditions of service of Central Government employees.

Q.12 What is workmen's compensation act 1923 and its features?

Ans: It provides for Payment of compensation to workers in case of accidents involving injuries to them or to their dependents in case of death. The Act also provides for a machinery to deal with claims of the workers.

Important features:

1. Pay limit which was Rs.1000 hitherto) for a person in Schedule II to be a "Workman" has been removed. So now such a person shall be covered by this Act irrespective of his pay limit.
2. The amount of compensation will now be related to a 'relevant factor' has been given in Schedule IV.
3. ½ monthly payments will now be 25% of monthly wages.
4. Amount spent on medical treatment shall not be deemed as a payment or allowance received by worker
5. A new and more comprehensive Schedule III of Occupational disease' has been given.

Q.13 What are the objectives and applicability of factories act 1948?

Ans: The Act lays down the obligation of the occupier of a factory in the matter of cleanliness of the premises, disposal of wastes and effluents, maintenance of proper ventilation and temperature, prevention of overcrowding, provision of cool drinking water, latrines and urinals, fencing of machinery, maintenance of machines in safe condition, precautionary measures against fire hazard, provision of washing facilities, fixing of weekly holidays and payment of overtime allowance, prevention of accidents etc. The factories Act applied to all Railway Workshops and production units, but does not extend to Loco sheds and carriage and Wagon Depots which have been specially exempted.

Q.14 What are the objectives and applicability of payment of wages act 1936?

Ans: This Act Aims securing prompt and regular payment of wages without any arbitration. Deductions to certain clause of person employed in Industrial Establishment including Railway either directly or through a sub – Contractor by a person full filling agreement with Railways and Employing or having employed twenty or more person are any day of proceeding 12 months.

Q.15 What is the classification of workers under HOER?

Ans: (i) Continuous: An employment is continuous except when it is "Excluded" or declared to be "Intensive" or "Essentially Intermittent".

(ii) Intensive: An employment is intensive when declared to be so on grounds that it is of a strenuous nature involving continued mental or physical strain or hard manual labour with little or no periods of relaxation.

(iii) Essentially intermittent: An employment is essentially intermittent. When it is declared to be so on grounds that daily hours of duty normally include periods of inaction aggregating to

six hours or more including at least one such period of not less than one hour or two such periods of not less than half an hour each during which the employee may be on duty but is not called upon to display either physical activity or sustained attention.

Q.16 What is the railway conduct rule 1966

Ans: The conduct rules which were revised as a result of recommendation of Shanthanam Committee and other prescribed the standard of conduct expected of every Railway servant and members of their family. All orders / instructions issued by Supervisors from time to time must be obeyed.

Q.17 What are the principles for natural justice?

Ans: Principle of natural justice is the principles which lay down and elaborate the reasonable opportunity which should be given to the charged employee.

Principles:

1. The hearing must be impartial.
2. Reasonable opportunity should be given to defend the case.
3. Reasons for decisions should be made known to the accused.
4. The charges should be intimated in advance.
5. Justice should not only be done, it should also appear to have been done.

Q.18 Describe appointing authority?

Ans Appointing Authority in relation to a Railway Servant means –

(a) the authority to make appointment to the service of which the railway servant is, for the time being a member or to be grade or the service in which the Railway servant is, for the time being included or

(b) the authority empowered to make appointments to the post which the Railway servant for the time being holds. Or

(c) The authority which appointed the Railway servant to such service, grade or post, as the case may be or

(d) where, the Railway servant having been a permanent member of any other service or having substantively held any other permanent post, has been in continuous employment under the Ministry of Railways, the authority which appointed him to that service or to any grade in that service or to that post, which ever authority is the highest authority.

Q.19 Describe disciplinary authority ?

- Ans:**
- (a) In relation to the imposition of a penalty on a Railway servant, the authority competent , to impose on him penalty is as per schedule in normal course and in case of imposing major penalties such authority would be Appointing Authority.
 - (b) In relation to Rule 9 (Major Penalty) and clauses (a) and (b) of sub rule (1) of Rule 11 (Minor Penalty) in the case of any Gazetted Officer, an authority competent to impose any of the penalties specified in Rules 6.

(c) In relation to Rule 9 in the case of any non-gazetted Railway servant, an authority competent to impose major penalties specified in Rule 6.

An authority, who can impose any penalty under D&A rules, may impose a minor penalty.

For initiating a disciplinary proceeding, an authority who is competent to impose a minor penalty, may issue the charge sheet. But as soon as he comes to know that based on the Inquiry (the punishment required to be imposed is not within his competence, he should forward the case to the competent authority.

Q.20 Define suspension under DA & R ?

Ans: Suspension is not a penalty.

(1) An employee may be placed under suspension –

(i) When a disciplinary proceeding is contemplated or pending against him or

(ii) When engaged in activities prejudicial to the interest of the State, or

(iii) When a criminal case is pending investigation, inquiry or trial..

(2) An employee shall be deemed to have been suspended:-

(i) If he remains in police custody for exceeding 48 hours.

(ii) If he is convicted for an offence and sentenced to imprisonment for a period exceeding 48 hours and is not forthwith dismissed removed or compulsorily retired.

Q.21 Define deemed suspension under DA & R ?

Ans: When a penalty of dismissal, removal or compulsory retirement, imposed on an employee under suspension, is set aside on appeal or revision and the case is remitted for further inquiry or action, the order of his suspension shall be deemed to have continued in force from the date of the original order of dismissal etc.

Q.22 Describe subsistence allowance?

Ans: Subsistence Allowance is allowance granted to employee under suspension equal the leave salary an half average pay and allowance admissible on such pay.

Q.23 Mention any four types of minor penalties?

Ans: Minor: (i) Censure

(ii) Withholding of promotion for specified period.

(iii) Recovery from pay of the whole or part of any pecuniary loss caused to the Rly. Adm. by his negligence etc.

(a) Withholding of passes or PTOs or both

(b) Reduction to lower stage in time scale for not more than 3 yrs. Without cumulative effect and not affecting adversely his retirement dues.

(iv) Withholding of increments (with or without cumulative effect).

Q.24 **Mention any four types of major penalties?**

Major: (1) Reduction to a lower stage
(2) Reduction to a lower time-scale, grade, post or service
(3) Compulsory Retirement
(4) Removal
(5) Dismissal.

Q.25 **What is ex-party enquiry?**

Ans: When charged employee refuses to participate the despite repeated sittings, but not when he is submitting Medical Certificate of sickness Ex-partee inquiry is conducted.

Q.26 **What is the period of availability of privilege passes?**

a) Single Journey pass – 3 months from the date of issue
b) Return Journey pass – 4 months from the date of issue
c) Settlement Pass – 1 year from Retirement
d) Kit Wagon Pass – 1 month from issue.

Q.27 **What is the meaning of “Family” in view of passes?**

Ans: (i) Wife/Husband whether earning or not.
(ii) Son under 21 years when wholly dependent
(iii) Unmarried daughters of any age – earning or not
(iv) Widowed daughters when wholly dependent (“Wholly dependent” is one whose monthly income from all sources including pension/pension equivalent does not exceed Rs.3000/- to rs.3500/- p.m. plus appropriate dearness relief as sanctioned from time to time or 15% of pay whichever is more.
(v) Step-sons, unmarried step-daughters.
Age limit will not apply to bonafide students and invalid children,.

Q.28 **Mention any 8 types of passes. ?**

Ans 1. Privilege Pass
2. Resident Card Pass
3. Duty Pass
4. Post Retirement Passes
5. Special Passes
6. Kit Passes or Transfer/Retirement
7. School Pass

8. Platinum Pass.

Q.29 What is encashment of leave?

Ans: Those retiring after 30-09-77 were able to draw cash equivalent of leave salary on average pay to the extent of LAP at their credit at the time of their retirement subject to maximum of 300 days LAP

For Group C & D Employees during service eligible Encashment of leave average pay upto 10 days at the time of availing passes/PTOs for a maximum period of 60 days in their entire service.

Q.30 What is the procedure for sanction of commuted leave?

Ans: Reconversion or commutation of one type of leave into another retrospectively may be considered if the sick and fit certificates are from the Authorized Railway Medical Attendant. LHAPs may be committed to LAP by surrendering 2 days LHAP for one day of LAP without any limit in case of an medical grounds.

Q.31 Define Maternity Leave?

Ans: It is a full pay leave, Female Government Servant with less than 2 Serving Children may be granted Maternity leave by an authority competent to grant leave for period of 135 days from the date of its commencement.

Total period of Maternity leave on account of mis-carriage/abortion should be restricted to 45 days in the entire service of Female Railway servant.

Q.32 Give any six General leave rules?

Ans: General:

- a) Leave cannot be claimed by the employee as a matter of right. The right to grant or refuse leave vests in the authority competent to sanction leave.
- b) The leave usually commences on the day charge is handed over and ends on the day the charge is taken over again.
- c) Leave sanctioning authority cannot alter the kind of leave due and applied for except at the written request of the employee.
- d) Leave already availed may be converted into another kind of leave on employee's request retrospectively but not after retirement.
- e) Leave cannot be sanctioned for more than 5 years.
- f) Combination of holidays proceeding or in continuation of leave is permitted. In case of medical certificate of sickness, the holidays will be part of sickness leave.
- g) The employee is not permitted to take up any employment during the period of leave.

Q.33 What is LHAP?

Ans: At the rate of 20 days per year. No restriction on accumulation. It can be availed on medical certificate or otherwise. It may be commuted to LAP by surrendering 2 days LHAP for one day of LAP without any limit in case of on medical grounds and upto 180 days in entire service in other cases. However, if any employee does not return to duty after commuted LHAP is over, it shall be reconverted to LHAP. Teachers will not earn LHAP after 11-12-84.

Q.34 Describe any six kinds of leave?

Ans:

1. LAP (Leave Average Pay)
2. LHAP (Leave Half Average Pay)
3. CL (Casual Leave)
4. ML (Maternity Leave)
5. SDL (Special Disability Leave)
6. S L (Study Leave)

Q.35 What is Restricted Holiday?

Ans: Restricted Holidays are optional Holidays. Two Restricted Holidays are to be selected by each employee working in administrative office from the list circulated for this purpose. The office opens on these days.

Q.36 What is productivity-linked Bonus?

Ans: Productivity Linked Bonus is a Bonus based on the productivity of the Railway during the year. The year 1977 – 100 is the base year entitling to a Bonus of 25 days and any excess or decrease over it by 2250 million Revenue Tonne KM will less bonus. If the productivity falls below Index 90 then no Bonus shall payable for that year.

Q.37 What is Incentive bonus?

Ans: If an employee does not withdraw any amount from his Provident Fund Account (including Voluntary Provident Fund) for a period of three continuous years. He is granted additional 1% incentive bonus as interest after adding up his interest for the third year.

Q.38 What is PF?

Ans: PF is Provident Fund. Every employee contributes 8 ½% of his monthly pay to his Provident Fund Account which is maintained in the Accounts Department. This amount to recovered from his pay Bill. Each Provident Fund Account is allotted a Specified number.

Q.39 What is Local Purchase?

Ans: The local Purchase need of stock and Non-stock items arises (a) to meet the emergencies (b) to maintain operation efficiency (c) to procure items of small value which have not been stocked as per policy of Railways and (d) when supplies are not received against contracts and stores are required immediately.

Q.40 Describe the PL Number under the Material Management?

Ans The stores items have been codified in an eight metric structure under an “Integrated Data Processing Technique for materials and Stores”. The code number of an item (XX XX XXXX) is described as follows: First two digits indicate the group as per revised classification. Next two digits indicate the sub-group in which the item is listed. Last four digits indicate the serial number of all item – the last digit of the four represents the check digit calculated on MODULUS ii METHOD.

Q.41 What is the ABC Method of material Management?

Ans ABC Analysis: To have EFFECTIVE CONTROL, THE Railway Board have classified the stores and fixed ceilings as under: A. 1. Category: Annual usage value – above Rs.5 lakhs A. 2 Category: All items having annual usage value between Rs.50,000 and 5 lakhs - Stock not to exceed three months requirement.

B.1 Category: All items having annual usage of Rs.25,000 & above but below Rs.50,000 – Stock not to exceed six months requirement.

B 2. Category: All items having annual usage value of Rs.10,000 and above, but below Rs.25,000/- - Stock not to exceed six months requirements.

C Category: All items having annual usage of value of below Rs.10,000 – Stock not to exceed 12 months requirement.

D Category: All items which not moved more than one or two years.

Q.42 Under what condition should a PAC is issued.?

Ans: Proprietary Article Certificate is issued to Purchase the material if (a) No other make/brand will be suitable (b) This is the only firm who is manufacturing/stocking this item and (c) A similar article is not manufactured/sold by any other firm which could be used in lieu.

Q.43 What is Limited Tender?

Ans: Purchase through advertised tender is time consuming process and therefore, when the purchase value is less than Rs.3 lakhs or if the item is urgently required, we invite tenders from a limited number of firms. These firms are normally our approved suppliers, but in certain cases, limited tenders can be invited from unregistered firms also with the approval of the competent authority

Q.44 How to procure the stock items?

Ans: Stock items are purchased through COS/SC calling for tenders by Limited and Open tenders.

Q.45 How to revise the AAC of stock items?

Ans: AAC of the stock items are made once in a year. The same is vetted by accounts and sanctioned by ADRM. The items which are obsolete has to be deleted the items which are low value as to be deleted and procured through imprest. To increase the items of AAC justification should be given for increased in the AAC of the item.

Q.46 What is the Special Indent and when it should be used?

Ans: The special indent is used when item is not an imprest item for the consignee as special account and also the full quantity of the item is not supplied against P.D. (Periodical demand) and balance quantity will be drawn against special indent.

Q.47 What is the procedure for making the non-stock item into stock item?

Ans: The Non-stock item which is used frequently by the user department such items are to be converted into stock items. The stock items are procured by stores department and stock at various depots. The whole procedure for converting from NS to Stock item is done by SAF. The NS item is sent to stores depot for certification of stocking of the item and Associate Finance vetting is done and forwarded to HQrs. For onward transmission to COS Office for stocking and purchase.

Q.48 What is Zero based Budgeting?

Ans ZBB is that all the financial requirements of a Budget unit are analyzed, evaluated and justified annually and not just the increased or additional requirements. It is evaluation and prioritization of all programmes at different levels of efforts.

Q.49 What is the procedure for indent T & P items?

Ans: Non-Stock Indent has to be placed for procurement of T&P Item. Indent Rate up to 10,000/- should be approved by JAG Officer. Indent Rate more than Rs.10,000/- approval should be taken from ADRM / SAG for procurement of T&P items.
