SOUTH CENTRAL RAILWAY
Mechanical (Carriage & Wagon)
Question Bank
(WITH ANSWERS)
STC/SC
Q1. Explain the pattern of Freight Train Examination as per latest JPO No. 7/2014?

Answer:
As per JPO No. 7/2014, there shall be only three types of examinations for freight stock.

1. Closed Circuit Rake Examination (CC rake)
2. Premium Rake examination.
3. End to End examination

1) CC rake Examination (Periodical Monitoring Examination (PME))

1. Only Off POH/Off ROH wagons fitted with air brake system should be inducted as new CC rakes under normal circumstances. For formation of CC rakes other than this, CRSE’s approval is required, which should be recorded in writing.
2. CC rake shall be given 100% brake power during PME at original base depot.
3. CC rake examination is to be conducted only at nominated base depot. Code of base depot is to be stenciled on all the wagons.
4. The BPC of the rake shall be valid for 7500 kms or 35 days whichever is earlier. However, for BLC rakes BPC shall be valid for 6000 kms or 30 days whichever is earlier. Within this validity rake can subjected to any no. of loading/unloading.
5. After loading, at every loading point the CC rake BPC shall be revalidated in the form of GDR check as stipulated in Para 12.0 of the JPO.
6. CC rakes are allowed to run only in the circuit of the nominated zones.
7. Colour of BPC shall be yellow.
8. The CC rake BPC becomes invalid under the following conditions. These rakes have to be cleared up to next examination point in the direction of movement for examination and issuance of a fresh BPC up to PME depot. HQs Operating and C&W Control should be appraised of all such cases so that the rakes can be brought to the PME depot within 40 days from the day of issue of BPC.
   i) If rake integrity disturbed by more than 4 wagons within the validity of the BPC. Only up to 4 wagons attachment/detachment is permitted en route during the validity of the BPC.
   ii) If the rake stabled for more than 24 hours at nominated TXR examination yard / any other station, except the loading/unloading point.
   iii) If CC rakes moved to any other zone not mentioned in the circuit.
   iv) If overdue CC rake is not moved in the direction of PME depot.
   v) If the driver fails to log the kilometers on the BPC correctly. (BPC of such CC rakes will deemed to be valid only for 20 days.

2) Premium End to End Rake examination:

1. Premium End – to End rakes will be formed out of Air Brake open stock (BOXN, BOXNHA, BOXNHS), covered stock (BCN, BCNA, BCNA HS), BOBR and BOBRN. On S. C. Railway, Premium end-to-end rakes will be intensively examined in empty condition and certified by examination points at BPA, RDM, GY, BZA, COA, SNF and PAU on the nominated lines, (‘A’ category depots or depots should be upgraded to “A” category depots).
2. Brake power certificate issued for such premium end-to-end rakes will be valid for 12 days from the date of issue. During this 12 day period, the rakes will be allowed multiple loading/unloading. Loading after 12th day should be prohibited so that the rake is not overdue.
3. After the lapse of 12 days, the rake should be offered for next intensive examination at the first examination point in the direction of movement. To avoid examination in loaded
condition, a grace period of 3 days be permitted, if the rake is in loaded condition on 12th day.

4. However, after expiry of the grace period, i.e., after a lapse of 15 days from the day of issue of BPC, even a loaded premium rake shall be offered for examination at the first train examination point in the direction of movement and BPC is issued in End to End format up to the unloading point only.

5. Brake power certificate for premium end-to-end rakes to be issued with proper format in green colour paper.

6. Minimum brake power should be 95% at originating station.

7. The movement of Premium end to end rakes will be monitored through FOIS by traffic.

3) **End to End examination:**

All trains which are not checked in the CC or Premium rake examination will come under this category. This is for all stocks including mixed stock where freight wagons are available.

1. Empty rakes shall be offered in full formation for examination and issue of BPCs. Thereafter C&W staff will carry out no further examination after loading. After such examination, the empty rake should be moved to the loading station as per the requirement of traffic.

2. The validity of BPC for an empty rake will be given at the train examining point as “Up to loading point & further up to unloading point”. But after loading the rake, the operating staff (commercial staff if no operating staff is posted at that station) shall ensure that the destination of the loaded train is clearly mentioned on the BPC and the same BPC valid up to destination.

3. The empty rake must reach the loading point within 4 days of the issue of BPC including the day of issue, for the loaded rake to move on the same BPC.

4. No driver shall move the loaded train from the loading point unless the destination is clearly mentioned on the BPC. BPC of the loaded train without destination shall be treated as invalid.

5. Green color BPC for Air brake stock and Pink color BPC for Vacuum Brake stock shall be used for such rakes.

6. Minimum brake power should be 90% for Air Brake stock and 85% for Vacuum Brake stock to be maintained at originating station after Intensive Examination.

**Q2. Explain procedure of intensive examination for Freight Stock?**

**Answer:**

The following procedure is to be followed for conducting intensive examination of freight trains

a) Rolling-in examination including axle box feeling for detection of any defects like flat tyre, loose parts, hanging parts and worm box.

b) Incoming BPC to be collected.

c) Inspection and repair of running gear fittings.

d) Inspection and repair of brake gear and spring gear.

e) Inspection and repair of draw and buffing gear.

f) Checking and making good the deficiency of safety fittings, safety brackets, safety loops etc.

g) Replacement of brake blocks, correct maintenance of SAB “A” dimension and piston stroke.

1. Minimum yard leaving Brake Block thickness – 20 mm
2. SAB “A” dimension – CASNUB bogie 70 +2/-0 mm

   BOBRN, BLC 27 +2/-0 mm

3. Piston stroke –

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<tr>
<th>STOCK</th>
<th>Empty</th>
<th>Load</th>
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<tr>
<td>BOXN, BCN, BCNA, BRN, BTGLN</td>
<td>85±10MM</td>
<td>130±1010MM</td>
</tr>
<tr>
<td>BTPN</td>
<td>87±10MM</td>
<td>117±10MM</td>
</tr>
<tr>
<td>BVZC</td>
<td>70±10MM</td>
<td></td>
</tr>
</tbody>
</table>
h) Correct fitment of washers, bulb cotters and all brake gear pins to be ensured.

i) Correct functioning of empty/load device.

j) Checking and securing of air brake components for their proper functioning and fitment.

k) Wheel profile to be checked for rejectable defects.

l) Visual examination of Bogie frame and spring for cracks/breakage.

m) Ensure correct requirement of brake power as per JPO No. 7/2014
   1. CC rakes – 100%
   2. Premium rakes – 95%
   3. End to End rakes – 90% (for Air brake) & 85% (Vacuum brake)

n) Issue BPC in proper format as per JPO No. 7/2014.

Q3. Explain maintenance of departmental wagons in open line?

Answer:

Maintenance of departmental wagons falls under the category of End to End intensive examination.

Types of departmental wagons:
1. Sleeper carriers
2. Rail carriers
3. Ballast wagons
4. 10RP/20RP carriers (rails of 130m/260m lengths).

- BCXSC, BOXSC etc. are the wagons used as sleeper carriers as well as rail carriers. These wagons are made out of over aged BCX, BOX wagons by removing the end walls and side walls to enable mechanized loading and unloading at PQRS (Plaser Quick Relaying System).
- BOBYN wagons which are specially designed for carrying and lying of ballast are categorized as ballast carriers.
- Modified BRN/BRNA wagons are categorized as 10RP/20RP (Rail Panels) carriers which are used to carry the rails from manufacturing unit to site.

- All the departmental wagons are to be based at nominated depot and code of the base depot should be clearly stenciled on these wagons.
- Normally all the departmental wagons are to be examined intensively in empty condition.
- In case of Sleeper carriers, Rail carriers and Ballast carriers fresh BPC will be issued after intensive examination.
- The originating Brake Power of these trains would be 90%.
- The validity of BPC for wagons having CANUB bogies with Air Braked stock will be for 30 days without weekly revalidation.
- The validity of BPC for wagons having UIC bogies with Air Braked stock will be for 30 days with fortnightly revalidation.
- After loading / unloading GDR check should be conducted in view of safety of the train.

Q4. Explain RPC – IV rules for coaching stock?

Answer: Railway Board has issued guidelines for maintenance and examination of coaching trains under Revised Policy Circular IV.

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<th>Category of trains</th>
<th>Preventive Maint. schedules at pit line</th>
<th>Under gear examination and brake system maintenance</th>
<th>Internal cleaning pass. amenity attention</th>
<th>External cleaning on nominated line with proper</th>
<th>Enroute/Terminating examination</th>
<th>Brake system check prior to start at PF at the other end</th>
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</tr>
<tr>
<td></td>
<td>at pit line</td>
<td>and watering</td>
<td>facilities</td>
<td></td>
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<tr>
<td>1</td>
<td>Mail/exp. One-way run&gt;3500 KMs</td>
<td>At primary end</td>
<td>At both the ends</td>
<td>At both the ends</td>
<td>Enroute: After every 250 to 350 KMs of run at locations to be decided by Railway for each train Terminating Exam at each terminating station Complete air/vacuum check with fresh BPC</td>
<td></td>
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<tr>
<td>2</td>
<td>Mail/Exp. one way run&lt;3500 KMs but round trip run&gt; 3500 KMs</td>
<td>At primary end</td>
<td>At both the ends</td>
<td>At both ends</td>
<td>-do-</td>
<td>Complete air/vacuum check with fresh BPC</td>
<td></td>
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<tr>
<td>3(a)</td>
<td>Mail/Exp. round trip run up to 3500 KMs</td>
<td>At primary end</td>
<td>At both the ends</td>
<td>At both the ends</td>
<td>-do-</td>
<td>Only continuity check if stabled at platform, otherwise, brake power check with endorsement on original BPC</td>
<td></td>
</tr>
<tr>
<td>3(b)</td>
<td>Shuttles/Inter connected Mail/Exp. round trip run up to 3500 KMs</td>
<td>At primary end</td>
<td>To be done after 3500 KMs or 96 hours whichever is only at primary end</td>
<td>At primary end and each terminal or as decided by the CME to ensure proper cleanliness</td>
<td>At primary end once a day for shuttles.</td>
<td>Enroute: After every 250 to 350 KMs of run at locations to be decided by Railway for each train Terminating Exam at each terminating station Only continuity check if stabled at platform, otherwise, brake power check with endorsement on original BPC</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Passenger trains with toilets including interconnected passenger trains/ shuttles</td>
<td>At primary end</td>
<td>To be done after 3500 KMs or 96 hours whichever is earlier at primary end</td>
<td>At every terminal or as decided by the CME to ensure proper cleanliness</td>
<td>At primary end</td>
<td>Enroute: After every 250 to 350 KMs of run at locations to be decided by Railway for each train Terminating Exam once a day at nominated terminating station Only continuity check if stabled at platform, otherwise, brake power check with endorsement on original BPC</td>
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<tr>
<td>5</td>
<td>Passenger trains without toilets</td>
<td>At primary end</td>
<td>To be done after 3500 KMs or 7 days whichever is earlier at primary end</td>
<td>Once a day</td>
<td>At primary end</td>
<td>Once a day at primary or a nominated terminal Only continuity check if stabled at platform, otherwise, brake power check with endorsement on original BPC.</td>
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Q5. **What is rolling in and rolling out examination? What are the advantages?**

**Answer:**

**Rolling in Examination**

All terminating and pass through trains are given rolling in examination, while entering a station with C&W depot. JE/SSE(C&W) and his staff should take up position on both sides of the line short of the normal halting place on which the train is to be received and the following inspection should be carried out.

1. Look out for any loose or dangling components.
2. Observe whether there are any flat places on the tyre (skidded wheel).
3. Observe and listen for any worm axle box (damages in roller bearing).
4. Defective / broken springs.
5. Defective / drooping buffers.
6. Abnormal behaviour of any of the vehicles, or any other observations which may lead to unsafe working condition.

**Rolling out Examination**

Similarly, while the train is leaving from the platform / yard, rolling out examination is also to be conducted to avoid the above mentioned defects and the last minute detentions.

**Advantages of conducting Rolling in / out examination:**
• It will reveal the defects of rolling stock which can’t be identified / checked when it is stabled.
• This simple examination will save lot of time and avoid major disasters.

Q6. Explain various wheel defects and their effects with limits of rejections and draw sketch of tyre defect gauge?
Answer:

<table>
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<tr>
<th>Wheel defects</th>
<th>Standard</th>
<th>Condemning Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharp Flange</td>
<td>14.5mm</td>
<td>5 mm or Less</td>
</tr>
<tr>
<td>Thin Flange</td>
<td>28.5mm</td>
<td>16mm or Less</td>
</tr>
<tr>
<td>Less radius at root of flange</td>
<td>16mm-IRS</td>
<td>13 or Less</td>
</tr>
<tr>
<td></td>
<td>14mm-WWP</td>
<td></td>
</tr>
<tr>
<td>Hollow Tyre</td>
<td>-----</td>
<td>5 mm or above</td>
</tr>
<tr>
<td>Deep Flange</td>
<td>28.5mm</td>
<td>35mm or more</td>
</tr>
<tr>
<td>Thin Tyre</td>
<td>-----</td>
<td>28 mm or Less</td>
</tr>
<tr>
<td>Flat Tyre</td>
<td>-----</td>
<td>50 mm or more – for Coaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 mm or more – for Goods</td>
</tr>
</tbody>
</table>

Effects of Wheel defects:
1. **Sharp flange**: when allowed into service it leads the vehicle to two roads while negotiating defective points/crossings.
2. **Thin flange**: when allowed into service worn-out flange will break due to longitudinal reaction by track and vehicle derails.
3. **Less radius root**: It will lead to excessive angle of attack and lead to climbing of flange on to rail table and leads to derailment.
4. **Hallow tyre and Deep flange**: Often these two will appear on wheel tread together. When allowed into service results in rough riding with noise and damages fish plates and fish bolts of the track disconnects the rail joints. This will cause the following train to derail.
5. **Thin tyre**: When solid wheels have reached to its lowest allowed wheel diameter, the load bearing capacity of the wheel reduce drastically and will get sheared under the heavy rolling loads causing major disaster.
6. **Flat tyre**: This will cause hammer blow effect on the rails and rail fittings while in run.
Q7. **What do you mean by CMI K-003? What are the defects to be observed as per CMI K-003?**  

**Answer:**  
CMI-K-003 means carriage maintenance instructions issued by RDSO in the year 2003. As per the CMI-K-003, the wheels are to be checked visually for the following defects.

1. **Shattered Rim:** A fracture on the wheel tread or flange is called Shattered Rim. It is a rejectable defect.

2. **Spread Rim:** If the rim widens out for a short distance on the front face, an internal defect may be present. Spreading of rim is usually accompanied by flattening of the tread, which may or may not have cracks or shelling on the tread. Such a wheel must be withdrawn from the service. This condition should not be confused with a uniform curling over the outer edge of the rim around the entire wheel, is called rim flow. Rim flow is not a rejectable defect.
3. **Thermal cracks**: Thermal cracks appear on a wheel tread due to intense heating of the arising out of severe brake binding. Such cracks occur on the tread and generally progress across the tread in a transverse and radial direction.

Whenever such a crack become visible on the outer face of the rim or tread crack as reached the outer edge(non-gauge face) of the rim, the wheel should be withdrawn from the service. If a crack becomes visible on the outer flange face, the wheel withdrawn from service. Such wheels should be sent to workshops for examinations and subsequent rejections.

Wheels involved in service brake binding should be examined carefully during the maintenance to rule out the possibility reject able thermal cracks. Such wheels may be identified by the presence of flats (may be within acceptable limits) and severe discoloration or blue black heating marks on the tread.

4. **Heat checks**: Thermal cracks are deeper and need to be distinguished from fine superficial cracks visible on the tread on or adjacent to the breaking surface. These are called heat checks, which are usually denser than thermal cracks. Heat checks are caused on the tread due to heating and cooling cycles undergone by the wheel during normal breaking. Such wheels do not need to be withdrawn but should be carefully distinguished from the reject able thermal cracks.

5. **Shelled Tread**: Shelling can be identified by pieces of metal breaking out of the tread surface in several places more or less continuously around the rim. Shelling takes place when small pieces of metal breakout between the fine thermal cracks. These are generally associated with small skid marks or “chain sliding”. Such wheels should be withdrawn from service and sent to workshops for reprofiling.
6. Disc crack: A crack on the disc due to material failure is called disc crack. Disc crack of any length on disc plate is a rejectable defect.

Q8. Explain new numbering system of wagon stock from 2003?
Answer:
New wagon numbering system introduced on Indian Railways from the year 2003. According to this system wagon number contains “11” digits.
- First 2 digits indicates type of wagon (1\textsuperscript{st} & 2\textsuperscript{nd})
- Next 2 digits indicate owning railway (3\textsuperscript{rd} & 4\textsuperscript{th})
- Next 2 digits indicates year of manufacture (5\textsuperscript{th} & 6\textsuperscript{th})
- Next 4 digits indicates individual wagon number (7\textsuperscript{th}, 8\textsuperscript{th}, 9\textsuperscript{th} & 10\textsuperscript{th})
- Last digit is a check digit (11\textsuperscript{th})

<table>
<thead>
<tr>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>D6</th>
<th>D7</th>
<th>D8</th>
<th>D9</th>
<th>D10</th>
<th>D11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of wagon</td>
<td>Owning Railway</td>
<td>Year of manufacture</td>
<td>Individual wagon number</td>
<td>Check digit</td>
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</table>

However for convenience in normal day to day work owning railway and type of wagon would be stenciled “alphabetically” also.
For example South Central Railway BCNHL wagon manufactured in the year 2009 will be stenciled as:

\textbf{SC BCNHL 33 05 09 2876 5}

Procedure for finding the check digit:
Step 1--- Add all the “odd placed numbers” (ie. 1\textsuperscript{st}+ 3\textsuperscript{rd} + 5\textsuperscript{th} + 7\textsuperscript{th} + 9\textsuperscript{th})
\text{Sum1(S1) = D1+D3+D5+D7+D9 = 3+0+0+2+7 =12}

Step 2--- Add even placed numbers (ie. 2\textsuperscript{nd}+ 4\textsuperscript{th} + 6\textsuperscript{th} + 8\textsuperscript{th} + 10\textsuperscript{th})
\text{Sum 2 (S2) = D2+D4+D6+D8+D10 = 3+5+9+8+6 =31}

Step 3 --- Multiply S2 with 3
S3 = S2X3 = 31X3 =93

Step 4 --- Add (S1+S3)
S4= S1+S3 = 12+93 =105

STEP 5--- This S4 is to be rounded up to next multiple of 10 by adding a “single digit number” = 105+5 = 110 (110 is a multiple of 10)

Now the number added to round up S4 is the “Check Digit” i.e. 5 (in this case)

Q9. Explain the numbering system of coaching stock?
Answer: Numbering system of coaching stock:
\textbf{Eg: SC 11201/C}
- Coach number is an “Alpha Numeric” code which gives the details of the coach.
- The alphabetical code represents the owning railway. It may be of two letters or more. Eg: SC – South Central Railway
  ECoR – East Coast Railway etc.
- The numerical portion consists 5 digits
- First 2 digits represents year of manufacture of the coach.
  Eg: 95 – year of manufacture 1995
  00 – Year of manufacture 2000 etc.
- Next 3 digits indicate the type of coach and individual number of the coach. The codification for type of coaches is as under.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Type of Coach</th>
<th>Range of numbers in 3 digits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FAC</td>
<td>001 to 024</td>
</tr>
<tr>
<td>2</td>
<td>FACCW</td>
<td>025 to 049</td>
</tr>
<tr>
<td>3</td>
<td>ACCW</td>
<td>050 to 099</td>
</tr>
<tr>
<td>4</td>
<td>ACCN</td>
<td>100 to 149</td>
</tr>
<tr>
<td>5</td>
<td>ACCZ</td>
<td>150 to 199</td>
</tr>
<tr>
<td>6</td>
<td>GSCN</td>
<td>200 to 399</td>
</tr>
<tr>
<td>7</td>
<td>GS</td>
<td>400 to 599</td>
</tr>
<tr>
<td>8</td>
<td>GSCZ</td>
<td>600 to 699</td>
</tr>
</tbody>
</table>
Q10. **What is IRCA? How many parts are there in IRCA? Explain briefly?**

**Answer:**

IRCA – Indian Railway Conference Association situated in New Delhi gives out the rules for the standard and condemning sizes of various components used on a rolling stock. They also give the guidelines for the maintenance of rolling stock in workshops and in open lines. The rulebooks issued for the Carriage & Wagon department are:

**Part III - For Wagon Stock**

**Part IV - For Coaching Stock**

There are 4 chapters in each parts IRCA

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<td>Rejection rules</td>
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Q11. **List out rejectable items for good stock as per IRCA Part – III?**

**Answer:**

- Wheel defects such as sharp flange, thin flange, deep flange, hollow tyre, skidded wheel etc.
- CBC coupler body broken / cracked.
- Center pivots broken / cracked.
- Trolley frame cracked or broken.
- Hotbox.
- Sliding type brake beam broken / bent.
- Suspension bracket broken on UIC stock.
- Trolley frame broken at horn gap stiffer & Bridle bar breakage.
- CBC yoke broken.
- CBC draft gear defect.

Q12. **List out rejectable items for coaching stock as per IRCA part – IV?**

**Answer:**

**Body repairs:**

Door repairs, corrosion repairs of under frame near lavatory and trough floor repairs, repairs to sole bar, repairs to head stock. Repairs to draw and buffing gear.

**Under gear repairs:**

Loose centre pivot bolts, crack in center pivot, center pivot bent.

**Axle box defects:**

Any cover broken, nonstandard, deficient sealing arrangement defective, oozing of lubricant, any hot box.

**Bogie repairs:**

Cracks in sole plate of bogie, bogie transom etc. Cracks in lower spring seat of dash pot, bent axle guide. Bogie out of square.

Breakage of any coil springs of axle box, breakage of bolster coil springs, anchor links, equalizing stay, shock absorber, suspension links, bottom spring plank.
Brake gear:
In effective DV, brake cylinder, leakage in isolating cock, cut-off angle cock, Defective PEASD and PEAV. Breakage of any pipe line.

Wheel defects:
Any tyre defect as prescribed in IRCA manual including the latest RDSO – CMI – K003 technical pamphlet.

Any coach due for POH, IOH and schedules, missing of APDs provided for brake gear suspension arrangement are considered as rejectable items under IRCA part IV.

Q13. What is maintenance? Why maintenance is required? Explain the maintenance systems followed on Indian Railway system?

Answer:
Maintenance:
The methods of inspection, replacement or repair of components / assemblies, usage of the quality of material / specifications of materials and keeping the tolerances / dimensions is called maintenance.

Why maintenance is required:
Maintenance is required on any equipment to keep it in good working condition with safety, security and reliability so that it shall not fail during the course of work.

Types of Maintenance:
I. Preventive maintenance: It is a method of carrying out inspection, repairs/replacements of components/assemblies before the failure of equipment.

   In Indian Railways the following preventive maintenance methods are followed:

II. Breakdown maintenance: It is a method of carrying out inspection, repairs/replacements of components/assemblies after the failure of equipment.

In Indian Railways the following breakdown maintenance methods are followed:
- Sick line attention,
- Attention of derailments and other accidents.

Both preventive and breakdown maintenances are followed on Indian Railways.

Q14. Define various maintenance practices on coaching stock?

Answer:
✓ Primary maintenance
✓ Secondary maintenance
✓ Terminal maintenance
✓ R&D

Primary maintenance:-
Primary maintenance will be done on all passenger carrying trains at primary maintenance depots on nominated trains notified by the Chief Mechanical Engineer of the Zone.

At primary maintenance depot all the primary maintenance schedule like trip schedule examination that is examination after every trip, schedule “A” or monthly examination, schedule “B” or quarterly examination and IOH (Intermediate over Hauling) will be done on the coaches in which they are running.

The attention during primary maintenance should be made more intensive with special emphasis as the public complaints regarding the amenities and comfort in travel are directly ascertained to primary maintenance depot. And all kinds of attentions except IOH are to be carried out with in the stipulated time of 6 Hrs.

Secondary maintenance:-
Secondary maintenance will be done on rakes which are terminated after a run more than 3500 KM at the other ends which are nominated for this purpose.

At secondary maintenance depots on termination the rake is to brought to pit line attend all the items of trip schedule, mandatory, like external washing, internal cleaning, watering,
provision of missing amenity fitting etc. and fresh BPC is to be issued up to primary maintenance depot.

**Terminal maintenance:-**

With in the validity of BPC whenever a train is terminated, like change in train number etc., the train has to be given certain attention as per RPC IV rules. This attention is called Terminal maintenance. All the terminating trains shall be examined at stations for safe to run examination, internal cleaning and watering to be attended. If the train is moved to yard and stabled for more than 1 Hr 45 Min BPC is to be endorsed with brake power check otherwise with air continuity.

**R & D:-**

R&D means receiving and dispatch. All the primary maintained rakes and passenger through trains shall be conducted rolling in examination, examination on terminating /and pass through.

The R&D staff shall take up position on both sides of the line short of the platform on which the terminating train/pass through train is to be received and watch the condition of running gear, flat places on tyres , axle box, broken springs, defective brake gear etc.,

The R&D staff should also check, the rakes after coming to halt, gear wise and ensure that no rejectable defects are there.

The R&D staff should also be dispatch the originating trains on platform by issuing BPC after the levels of air pressures are ensured on the engine and brake.

**Q15. Write all the preventive maintenance schedules to be attended for coaching stock with their periodicities?**

**Answer:**

Following are the preventive maintenance schedules to be attended on coaching stock for its better utilisation with almost no failures.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Name of the Schedule</th>
<th>Periodicity of the Schedule</th>
<th>Where the schedule to be carried out</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trip schedule</td>
<td>After every round trip</td>
<td>In pit line at PM depot &amp; SM depot</td>
</tr>
<tr>
<td>2</td>
<td>“A” schedule</td>
<td>1 month ± 3 days</td>
<td>In pit line at PM depot</td>
</tr>
<tr>
<td>3</td>
<td>“B” schedule</td>
<td>3 months ± 7 days</td>
<td>In pit line at PM depot</td>
</tr>
<tr>
<td>4</td>
<td>Intermediate Over Hauling (IOH)</td>
<td>12 months + 30 days for newly built coaches, midlife rehabilitated coaches and departmental coaches 9 months +30 days for all passenger carrying vehicles and other coaching vehicles other than newly built</td>
<td>In IOH depot after detaching from the formation at PM depot</td>
</tr>
<tr>
<td>5</td>
<td>Periodical Over Hauling (POH)</td>
<td>24 months for newly built coaches, midlife rehabilitated and departmental coaches 18 months for all passenger carrying vehicles and other coaching vehicles other than newly built</td>
<td>At workshops</td>
</tr>
</tbody>
</table>

- IOH of coaches running in Rajadhani & Sathabdi express is to done at work shop.
- During IOH of express, Garibradh, Jansatabthi and OCV’s running on express bogies are to be exchanged with overhauled bogies received from Workshops.
- “C” schedule is abolished after the POH periodicity is enhanced to 18 months from 12 months.

Departmental coaches comprise Inspection cars, Track recording cars, Coaches attached to BT rakes and TT machines, Coaches attached to MRV/ART specials.
Q16. What is trip schedule? What are the items to be attended during trip schedule?

Answer:

Trip Schedule: It is a preventive maintenance schedule to be attended on coaching after every round trip in pit line at Primary maintenance depot as well as at Secondary maintenance depot.

Following items are to be attended during “Trip Schedule”:
- The coaches should be washed / cleaned from outside and inside.
- Under frames, bogie frames, axle boxes, axle guards, springs etc are to be checked thoroughly from inside and outside the pit line.
- All moving parts to be lubricated.
- Oil in dashpot should be checked for leakage. Add/replenish with specified grade if the oil level is below 40 mm.
- Oil in side bearer to be checked for leakage. Add/replenish with specified grade if the oil level is low.
- Wheel profile and thickness should be visually examined and gauged in case they appear to be near condemning limits.
- All the air brake components are to be checked for their proper functioning with RTR.
- Alarm chain apparatus to be tested.
- Brake power to be checked and adjusted so that the piston stroke is within the specified limit.
- Check all the amenity fittings for its proper fitment and working.

Q17. What is “A” schedule? What are the activities to be carried out during “A” schedule?

Answer:

“A” schedule: It is preventive maintenance schedule to be attended on coaching stock in pit line at primary maintenance depot with periodicity of 1 month ± 3 days within the normal primary maintenance time.

Following items are to be attended during “A” schedule:
- All items of trip schedule.
- Intensive cleaning of coaches.
- Intensive cleaning of lavatory pans and commode with Vim or equivalent.
- Painting of commode chutes from inside and outside with black anti-corrosive paint after scraping and thorough cleaning.
- Thorough flushing of tanks.
- Checking of water pipes, flush pipes, flushing cocks, push cocks etc, for ease of operation and free flow of water.
- Thorough disinfection of all compartments.
- Thorough cleaning of chimneys of dining cars, buffet cars, tourist cars and inspection carriages by wire brushes.
- Examination and replacement where necessary of brake gear pins, split pins, safety loops/brackets and their securing devices.
- Examination for wear and replacement where necessary of brake hanger pins, brake blocks and brake heads.
- Thorough inspection and repairs of draw gear.
- Thorough inspection and repairs of buffers.
• Checking and replenishing of oil in side bearers and dashpots.
• Thorough check and repairs of SLR doors for easy and smooth operation and correct alignment of all wearing parts, loose screws etc.

Q18. What is “B” schedule? What are the activities to be carried out during “B” schedule?

Answer:
“B” schedule: It is preventive maintenance schedule to be attended on coaching stock in pit line at primary maintenance depot with periodicity of 3 months ± 7 days within the normal primary maintenance time.

Following items are to be attended during “B” schedule:
• All items of ‘A’ Schedule.
• Painting of lavatory from inside.
• Thorough inspection and repair of brake gear components.
• Examination overhauling and testing of alarm chain apparatus.
• Testing and repairs of roof, especially the one laid with over and under lays of rubberoid sheet before monsoon begins.
• Thorough checking of trough floor, turn under etc., from underneath for corrosion.
• Touching up of painted / printed portion, if faded or soiled.

Q19. What is IOH? Explain the procedure of IOH?

Answer:
Intermediate Over Hauling (IOH): It is preventive maintenance schedule to be attended on coaching stock at Primary maintenance depot after detaching the coach from the formation in the IOH shed with a periodicity of 12 months for newly built coaches and departmental coaches and 9 months for all passenger coaching vehicles and other coaching vehicles with a grace period of 30 days.

IOH is also given on overdue POH coach before allowing in to service to ensure safety of the coach and the coach is allowed to service for a period of 3 months only. After expiry of 3 month the coach must be sent to POH repairs at work shop.

During IOH of a coach bogies are to replaced with the over hauled bogies received from work shop only.

Following items are to be attended during IOH:

a. Thorough repairs of running gear, brake gear and buffing gear
b. Touching up damaged paint of coaches on outside as well as inside.
c. Polishing of the polished surfaces.
d. Thorough check of SAB
e. Testing of BP and FP gauges with the master gauge.
f. Thorough checking of train pipes under pressure of 2kg/sq cm to detect thin, corroded and punctured pipes.
g. Thorough cleaning and removal of dust, rust, dirt etc, accumulated at the pillars through the turn under holes, with coir brush and compressed air.
h. Thorough examination and repairs of upholstery, cushions, curtains etc.
i. Thorough checking and full repairs of all window shutters, safety catches, safety latches, staples and hasps of compartment, lavatory, body side and vestibule door step, locking gear etc., for ease of operation and safety.
j. Thorough checking and repairs of all damages of vinyl flooring of the compartment.
k. Ultra sonic flaw detection test of axles, where facilities are available.
l. Attention to corrosion of all ICF/BEML coaches as described below:
   i) C&W supervisors at PM depots should be fully familiar with the vulnerable areas of coaches for corrosion, viz., sole bars at doorways, lavatories and adjoining areas, Corridor sides – more so in case of SLRs’ which are used for fish, salt etc.
   ii) Following schedule should be strictly followed for all ICF/BEML coaches in C&W depots.
iii) Pocket between sole bars and turn ender should be thoroughly cleaned through the inspection opening of the sole bars and inspected with the help of torch light or inspection lamps.

iv) Drain holes provided in the trough floors should be kept clean and unclogged. If during the cleaning of these drain holes any accumulation of water is observed, the affected area should be very carefully inspected for possible corrosion.

v) A register should be maintained of the primary maintenance coaches on the subject.

Q20. What are the gauges used during IOH?

Answer:
The following gauges are to be used during IOH to ascertain the wear and tear and alignment of the bogie.

- Trammeling gauge
- Dash pot distance gauge
- Knuckle profile gauge
- Knuckle nose wear and stretch limit gauge.
- Aligning wing limit gauge.
- Vertical height aligning wing pocket and gauge arm gauge (Go gage)
- Vertical height aligning wing pocket and guard arm gauge (No-Go gauge)
- Buffer height gauge
- Wheel distant gauge
- Wheel profile gauge
- Tyre defect gauge.
- Comb gauge for flange thickness gauge

The following gauge are used for checking “H” type CBC

- Knuckle nose wear and stretch limit gauge.
- Aligning wing limit gauge
- Vertical height aligning wing pocket and guard arm gauge (GO Gauge)
- Vertical height aligning wing pocket and guard arm gauge (NOGO Gauge)

Q21. What are the safety precautions to be taken at Work spot?

Answer:
1. Use dry cotton cloths as per your sizes.
2. Wear shoes.
3. Use hand gloves while grinding, lifting heavy load, holding hot bodies.
4. Protect lines both sides by providing danger boards
5. Use nose mask where the dust is available.
6. Use helmets while working under gear
7. Use ear plugs, where then noise is more
8. Keep fire extinguishers, sand, water buckets.
9. Adopt proper methods
10. Display boards for failure/defective machinery.
11. Display ambulance phone no in the work places.
12. Put separate bins for new, reuse, and scrap materials
13. Use goggles and dark glass/welding shields while working with gas cutting & welding.

Q22. What are the items to be provided for an express fit coach to enhance its POH periodicity from 12 months to 18 months?

Answer:
To ensure proper utilisation and maximum availability of coaches for traffic utilisation to enhance the revenue without compromising on part of safety the POH periodicity of the coaches had been enhanced to 18 months from 12 months by providing the upgraded materials in the coaches during POH at work shop. CAMTECH, Gwalior issued guidelines for enhancement of POH periodicity of from 12 months to 18 months in January 2008. Vide these guidelines following items are to be provided on coaches during POH at workshop to the extent of 100% with new specifications issued by RDSO.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item Description</th>
<th>Upgraded Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PVC Flooring</td>
<td>RDSO/2006/CG-12</td>
</tr>
<tr>
<td>5.</td>
<td>Overhead water tanks</td>
<td>Two piece Overhead water tank to ICF Drg. No. ICF/SK-6-3-444 latest alteration</td>
</tr>
<tr>
<td>7.</td>
<td>Upper and Lower washers for primary suspension</td>
<td>High capacity Hytrel washers to spec. No. C-K409 (Rev.1)</td>
</tr>
<tr>
<td>8.</td>
<td>Silent block for anchor link</td>
<td>Injection moulded silent block for anchor link to spec. No. RDSO/2006/CG-5</td>
</tr>
</tbody>
</table>

Q23. **Explain salient features of ICF coach?**

**Answer:**

**Salient features of ICF Coach:**

1. All welded, stressed skin integral tubular construction adopted.
2. Provided with Anti telescopic body fitted with distraction tube inside the buffers with trough flooring.
3. Lavatories are provided on either ends near doorways.
4. Self aligning spherical roller bearings are used to minimize friction resistance and easy hauling with pendulum type axle box.
5. The bogie incorporates primary and secondary suspension arranged in series.
6. The axle boxes are guided by axle guides and wear and tear of axle boxes are eliminated with hydraulic dashpot arrangement provided for primary suspension.
7. The secondary suspension is provided with bolster springs and double acting telescopic shock absorbers.
8. Silent blocks are fitted in centre pivot and anchor links to reduce noise.
9. Unsprung mass is reduced by 18.5% as compared to IRS bogie by reducing wheel sizes.
10. The bogie frame is completely welded construction with flats and plates.
11. Modern welding technologies are adopted for welding due to which weight of bogie is reduced by 25% when compared to IRS.
12. Longer bolster suspension links to ensure better riding qualities. The links are inclined at an angle of 70° away from the coach vertically.

13. In these coaches pay load is not shared by trough floor.

14. Pressed “Z” sections are used for sole bar

Q24. What is an anti telescopic coach? What features made an ICF coach “Anti telescopic”?

Answer:

Initially railway carriages are wooden bodied. Wooden body is fixed on to the steel under frame. During accidents these wooden bodies are prone for more damages by piercing one coach in to another due to the weaker construction which is called telescopic nature. This telescopic nature of wooden coaches had led to heavy causalities during accidents. In order reduce the causalities concept of anti telescopic body was developed by using all metal, all welded and light weight materials.

Construction features which made an ICF coach shell “anti telescopic”:

The shell of ICF coach consists of pressed steel sections welded together with sheet covering. The skeleton shell consists of a series of hoops each consisting of floor cross beams, body side pillars and roof carlines. The sole bar, waist rail, cant rail and roof purlines held these hoops together. This is covered by roof sheet on top, side panels on sides and corrugated trough floor. The corrugated trough floor offer considerable resistance to longitudinal crushing loads. On each end specially designed head stock with compression/destruction tubes are welded. These tubes during collision get deformed absorbing most of the energy.

Body bolsters are welded on bottom side of trough floor. The coach ends consists 4 box section stanchions transversely connected by “Z” section stiffeners and are welded to head stock. During collisions impact is first absorbed largely by end stanchions. The residual shock is absorbed by deformation of destruction/compression tubes.

The reduction in tare weight of these coaches obtained by using light weight, high strength, and corrosion resistant CORTON steel and by use of light weight alloy fittings. The concept of stressed skin also helps achieving light weight of coaches. 1.6 mm thick sheet used on roof and 2 mm thick used on side wall and end wall.

The Integral Shell behaves as a hollow tube offering maximum resistance towards telescoping in case of end wall collision. The head stock consists of main and auxiliary head stock connected by a rigid buffer beam which transmits all the buffing forces to the under frame.

All the above features made an ICF coach “anti telescopic”.

Q25. Describe ICF all coil bogie. And explain sequence of transmission of “tractive force, braking force and load transmission” in ICF coach.

Answer:

Bogie: it is a general term used for the assembly of all suspension parts, which together support the coach body at the two ends. It includes the structural frame, wheels, axles and bearings, suspension links, springs etc.

ICF all coil bogie: the bogie frame is built from “I” section fabricated by welding. Axles are located on the bogie by telescopic dashpot and axle guide assemblies with wheel base of 2896mm. helical springs are used in both primary and secondary suspension stages. The axle guide device provides viscous damping across primary springs while hydraulic dampers are provided across secondary suspension stage. Dampers are protected against misalignment by resilient fittings. Isolation of vibration is effected by rubber pads in primary suspension. Weight of coach body is transmitted to its bogie by side bearers pitched 1600mm apart. Side bearer consists of lubricated metal slides immersed in oil bath. No vertical weight transfer is affected through bogie pivot, and pivot acts merely as a center of rotation and serve to transmit tractive and brake force only.

Transmission of tractive forces: The sequence of transmission of tractive force is follows.
Coupling – Head stock – under frame – Body bolster – Center pivot – Bogie bolster – Anchor links – Bogie frame – Axle guides – Axle box – Axle – wheels.

**Transmission of braking forces:** Transmission of braking force is reverse of that of tractive force.


Q26. **Write salient feature of LHB coach?**

**Answer:**
The salient features of LHB coaches are

a. These coaches are longer by 2.2 meters than the ICF coaches and hence more number of passengers can be accommodated in a given coach. As the length of the coach is longer the number of coaches required to form a formation is reduced and hence overall cost of maintenance becomes less.

b. These coaches are fitted with Axle Mounted Disc brakes to have an effective brake power to stop the train within the emergency braking distance. As the brake forces are acting on the Discs which are mounted on the Axles, the wear on the wheel tread caused due to tread brake is eliminated and hence the life of the wheels are considerably increased.

c. These coaches are fitted with Wheel slide protection device to prevent the wheel from getting skid. Due to various reasons it is possible for any one of the wheel to have lesser speed when compared to the other three wheels and in such a case it releases the air from the brake cylinder of the affected wheel automatically to prevent the wheels from getting skidding.

d. These coaches are fitted with Brake accelerator in the Brake pipe to bring BP pressure to zero during emergency brake application. The brake accelerator connects the Brake pipe with exhaust during emergency application to facilitate faster releasing of air from the brake pipe.

e. These coaches are provided with FIAT bogies, which are designed to run at a speed of 160 KMPH.

f. These coaches are fitted with Controlled discharge Toilet system designed to discharge the human waste when the speed reaches above 30 KMPH after completion of 5 flushing. The objective of this toilet system is to keep the station premises clean and hygienic.

g. These are fitted with tight lock AAR centre buffer coupler with anti-climbing feature to prevent the climbing of one coach over another in case of accidents.

h. The wheelbase of Bogie is 2560 mm.

i. These coaches are fitted with earthing device to prevent damages to the Roller bearings.

j. These coaches are fitted with roof mounted AC package units.

k. The following equipments are operated by electronically operated control system (Microprocessor)
   1. Wheel slide protection device.
   2. Controlled discharge toilet system.
   3. Water pumping device.
   4. Roof mounted AC package units

l. The riding index of LHB coach is 2.75 when compared to 3.25 in case of ICF Coaches

m. The passenger emergency alarms signal devices are provided inside passenger compartment. This is to avoid operation of PEASD by unauthorized persons from outside. There is no mechanical linkage like a chain and this handle directly operates the PEASD valve for venting the brake pipe pressure.

Q27. **Write salient features of Duranto express Hybrid coach?**

**Answer:**

It is hybrid coach manufactured as per the design of ICF bogie and shell with features of LHB shell.

a. For the first time non – AC sleeper coaches are introduced in Non – Stop trains.

b. Construction of shell is similar to that of ICF coach.
c. Instead of CARTON steel, stainless steel is used for construction, which resulted in reduction of tare weight by 2 Tonnes.
d. Length of the coach increased to accommodate more No of passenger coaches.
   No of berths in 3 – tire AC (ACCN) - 72 nos.
   No of berths in 3 tire Non - AC (SCN) - 78 nos.
e. All the coaches are provided with Auto closing sliding type vestibule door which will stop spreading of the fire in case of fire accident.
f. All the coaches are provided with CDTS for comfort of passengers.
g. Bogies is similar to ICF all coil bogie excepting that in secondary suspension air springs is provided instead of coil springs (Bolster springs) for better riding comfort which resulted in reduction of ride index to 2.5 against 3.5 in ICF all coil bogie.
h. Extra B.P / F.P hose pipes with cut off angle cocks are provided on either ends of coach so that in case of any defect occurred on air hose the corresponding angle cocks can be closed and Air hose can be used, thus maintaining the punctuality.
i. In case of isolation of Air spring even on one bogie / Coach entire train has to run with a speed not more than 60 KMPH up to destination.
j. Modification for the fitment of Air spring.
   a. **Bogie frame and suspension:** Air spring has been installed in secondary stage replacing steel coil springs. A fixed lower spring beam (As cradle) to accommodate the air spring has been provided on bogie bolster. A lateral hydraulic damper and lateral bump stop have been provided at secondary stage.
   b. **Bogie bolster:** Provision made for air inlet to air spring. 40 Lt additional reservoirs connected to each air spring. Duplex check valve is provided. Due to the above modifications BSS hangers, Equalizing stays are eliminated.

Q28. **What is the necessity of introduction of Air springs in Indian Railways?**

**Answer:**
In suburban trains like DEMU, the number of passengers entraining (Super Dense Crush Load) in to the coach cannot be controlled and hence the payload of the coach increases from 18 tons to 34 tons. This abnormal increase of payload reduces the Riding Clearances between the Coaches and Wayside platforms and also reduces buffer height resulting in severe hitting of coach on the platforms. Due to the Super Dense Crush Load the bolster springs become solid, which in turn damages / breaks the Coil springs resulting in discomfort to the passengers.
So to overcome the above problems **Air Suspension** (Air springs) is introduced in the secondary suspension to maintain a constant buffer height irrespective of loaded conditions by varying the pressure of air inside the air spring.

Due to its excellent riding index the air springs are introduced in Duronto express.

**Q29. Explain working of “Air spring” with neat sketch?**

**Answer:**

Air spring is a rubber bellow containing pressurized compressed air with an emergency rubber spring providing various suspension characteristics to maintain a constant Buffer height irrespective of the loaded condition.

Air spring
1. Emergency spring
2. Leveling valve
3. Adjustable screw rod
4. Duplex Valve
5. Main Air Reservoir
6. Auxiliary Reservoir
7. Isolating Cock
Air suspension is a suspension where properties of air are used for cushioning effect (springiness). Enclosed pressurized air in a pre-defined chamber called air springs, made up of rubber bellow & emergency rubber spring, provides various suspension characteristics including damping. Air springs are height-controlled load leveling suspension devices. With changing loads, air springs react initially by changing the distance between air springs support and vehicle body. The leveling valve is in turn actuated, either taking the compressed air pressure to the air spring or releasing air pressure from it to the atmosphere. This process continues until the original height is restored. This mechanism ensures a constant floor height on coaches provided with air springs, irrespective of loads.

**Q30. Compare air springs with coil springs and indicate advantages and characteristics of air springs.**

**Answer:**
- Unlike steel springs, air springs retain their height under changing loads. The low natural frequency of air spring suspension remains virtually constant.
- In case of coil spring, deflection is proportionate to the load, therefore, under high payload situation, space constraint becomes critical, leading to the use of stiffer springs resulting in unsatisfactory ride behavior and reduced speed potential.
- Air springs through their control mechanism offer a load proportionate stiffness, constant floor height and better ride behavior with higher speed.

**Advantages of Air springs:**
- Capable to sustain Super Dense Crush Load of suburban traffic at high speeds.
- It maintains a Constant floor height of coach.
- It facilitates excellent riding comfort with riding index of 2.5.
- Safe running due to the excellent Air Damping.
- Low design height.
- Unusual noise emitted due to hitting of coaches on the platforms is eliminated.
- The Stirrup links, Coil springs and equalizing stays are eliminated and therefore easy to maintenance.

**Characteristics:**
- Soft flexible characteristics in vertical direction achieved by compression of air.
- Excellent lateral spring characteristics achieved by variation in effective area in lateral direction.
- Avoids excess air consumption due to instantaneous modes of oscillation / change in pressure achieved by delayed reaction in leveling valve.

**Q31. List out the parts of “Air Spring” and explain their functions briefly?**

**Answer:**

- **The leveling valve** is fitted with Top bolster and is designed to move up and down along with bolster. Under normal condition, it is designed to take LAP position when the actual buffer height is equal to the required buffer height.

![Equalisation Diagram](image1)

The function of leveling valve is to connect the main reservoir with the air spring to admit more pressure in to the Air spring, whenever the actual buffer height is less than the required buffer height due to abnormal increase in the Pay load (Super Dense Crush load).

![Loading Diagram](image2)

It also connects the air springs with exhaust to release the excess air from air spring, whenever the actual buffer height is more than required buffer height due to reduction in the Pay load after detraining of passengers from the coach.
Installation lever:

It is fitted between the leveling valve and bottom of the bogie frame. The function of installation lever is to operate the leveling valve automatically by moving the handle of the leveling valve up and down according to the condition of the load. The up and down movement of handle of leveling valve admits the compressed air in to the Air spring or releases the compressed air from the air spring through leveling valve in proportion to the pay load of the coach.

Duplex Valve:

It is a double check valve provided between the Air springs of the same bogie. It operates with a Pressure differential of 1.5 bar. Basically it comprises of two check valves side by side, arranged so that air can flow in either direction whenever the air pressure differential exceeds the pre-set value of 1.5 bar. Whenever a burst of air spring occurs on one side, this valve will ensure that no severe tilt or twist occurs during movement of the coach.

Both the check valves of Duplex valve remains closed, if the pressure between the two springs is within 1.5 bars.

When the differential air pressure exceeds the preset value, the air at higher pressure overcomes the spring pressure and flows to the lower pressure via the check valve. The flow continues till the differential reaches the preset value.

In case of burst of Air Spring, the air leaks to atmosphere. Due to high-pressure differential, the Duplex check valve releases the air from the intact air spring through burst air spring. Thus complete coach will gradually come down and rest on the emergency rubber springs.

Auxiliary reservoir: It is fitted with the Air spring. The capacity of this reservoir is 40 Ltrs. There is an orifice kept between air spring and additional reservoir. It acts as an Air damper to overcome vertical and lateral oscillations so as to increase the riding comfort.

Main reservoir: The capacity of the main reservoir is 150 ltrs and it is exclusively used for feeding the compressed air in to the Air Spring.

Emergency spring: The function of emergency spring is to support the top bolster to prevent tilt of coaches whenever the Air spring burst.

Q32. Explain working of CDTS with neat sketch?

Answer:
The objectives of CDTS are

- To keep the station premises clean and hygiene.
- To release the human discrete away from the station limits.
- To decrease water consumption during flushing.
- To keep toilets clean, odorless and aesthetic.
- To pressurize the water during flushing cycle.

Controlled discharge toilet units are fitted to avoid soiling of track in station and inhabited areas. Waste is stored into an immediate tank, which is closed off by microprocessor-controlled slide valves. The slide valve for waste tank outlet opens automatically at speeds above 30 kmph. The toilet units are fitted with button operated flush valves that flush with water, which is pressurized using compressed air. The tanks have a capacity of storage of material for 5 flushes and must be emptied before use.
The system comprises the following:

<table>
<thead>
<tr>
<th></th>
<th><strong>Control module</strong></th>
<th>Having a programmable logic controller (PLC) used for counting the number of cycle as well as the speed sensing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>Water pressuriser</strong></td>
<td>A pressure pump used for pumping water from overhead tank with high pressure to clean the toilet bowl.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Retention tank</strong></td>
<td>A cylindrical tank with 40 Ltrs. capacity connected below the toilet bowl with two sliding valves each one at top &amp; bottom.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Slide valves</strong></td>
<td>Two numbers of electro-operated by the control module during flushing cycle and discharge.</td>
</tr>
<tr>
<td></td>
<td>Top valve is designed to open and close in every flushing cycle with the cycle time of 15 Sec. (can be adjustable)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bottom valve is designed to open and close after completion of 15 flushing cycles and also when the vehicle speed is above 30 KMPH.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Water check valve</strong></td>
<td>An electrically operated magnetic solenoid valve, used for opening and closing pressurised water during flushing cycle. It admits 2.5 Ltrs. For Indian water closet and 1.5 Ltrs. for European water closet in 12 Sec.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Bye-pass valve</strong></td>
<td>A hand operated push cock which bye passes the water circuit during emergency situation i.e. in case of electricity failure and failure of CDTS.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Pressure switch</strong></td>
<td>A fail-safe system, which opens the top slide valve of the retention tank in case of failure of air supply/ electric supply to use the toilet as an ordinary toilet.</td>
</tr>
</tbody>
</table>

**Working:** The **flushing cycle** is explained as follows:
1. Flush button is pressed (Soft press)
2. Water pressuriser starts working
3. Water check valve opens.
4. Pressurised water flows from the circuit to the toilet bowl and flushing takes place.
5. Top slide valve opens and flushed water goes to the retention tank.
7. Water check valve closes.
8. Top sliding valve closes.
At the end of every 5th cycle and if the speed of the vehicle is equal to or above 30 KMPH. The bottom discharge valve will be opened and discharges take place. The speed is sensed from the wheel slide protection device, in which the signal from every axle is obtained by a phonic wheel electromagnetic mechanism.

Q33. **What is the procedure to be followed while attaching the coaches fitted with “H” type CBC with locomotives fitted with “E” type CBC as per JPO?**

**Answer:**

As per JPO dated 07-04-2009 the following procedure to be adopted while attaching the coach fitted with “H” type CBC to Loco fitted with “E” type CBC.

1. After berthing the CBC rake on platform and before releasing the rake by C&W staff, the first five coaches to be in brake applied condition.
2. The loco shall be brought to the same line and to be stopped 20 m from first coach and to move cautiously observing the hand signals.
3. The first coach CBC and Loco CBC should be aligned horizontally so that they are in gathering range.
4. The nominated supervisors of C&W and Loco supervisor will ensure the following
   - Vertical gathering between the two CBCs is to be within the allowed range. If vertical gathering range is not within limits, the buffer heights of the Loco and Coach should be checked (i.e. limits 1030mm to 1105mm). If buffer height of SLR is not within the prescribed limits due to over loading, the over load contents should be unloaded from SLR in accordance with the extent procedure with the permission obtained by Dy.SS.”
5. SC Railway will not apply any lubricant on internal coupler parts of CBC. Since the practice of using lubricant on internal parts is in vogue in electrical and diesel maintenance points/ loco sheds, thus in case any lubricant/ grease available will be wiped out by C&W staff before coupling.
6. Then the following procedure to be ensured
   - Remove tell tale pin (locking pin) of CBC of Coach intended to be coupled.
   - Open the knuckle of the CBC of coach wide open.
   - Remove locking pin of loco CBC intended to be coupled.
   - Open knuckle of the BC of Loco wide open.
   - Align both the CBCs in a line of gathering range.
   - Guide the loco pilot through hand signals to proceed 2 to 3 KMPH for coupling.
   - After coupling is made, ensure proper seating of lock of “H” type CBC by observing the clear visibility of inverted “V” tell tale sign, yellow colour circular mark on lock lift assembly and position of lock lifter rib is vertical and insert the telltale pin and lock of loco CBC dropped fully.
   - Ask loco pilot to notch and test proper coupling of knuckles.
   - Once coupling is ensured provide tell-tale pin in slot and tie with GI wire to avoid accidental coming out on run. Provide washers on tail piece followed split pin. The split pin end to be opened up there after.
   - The locking pin of loco to be placed in position and to be tied up by GI wire to prevent any accidental falling out.
   - Ask loco pilot notches for checking the proper coupling by pulling apart the loco. Once it is pulled, C&W staff should insert the shims and fix the restrictor and ensure proper coupling. The shims should be tied with GI wire by C&W staff.
   - After ensuring proper coupling, the brake of 1st five coaches should be released by C&W staff.

Then the loco pilot and guard should ensure the air continuity in presence of TXR for issue of BPC.

Q34. **What are the different amenity and safety fittings in coaches?**

**Answer:**

The different amenity fittings in a coach are:

<table>
<thead>
<tr>
<th>Main Door</th>
<th>Door handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand rails</td>
<td>Latches to close the door</td>
</tr>
<tr>
<td>Seat</td>
<td>Berth</td>
</tr>
<tr>
<td>Berth Chain</td>
<td>Window</td>
</tr>
<tr>
<td>Window bars</td>
<td>Roof ventilator</td>
</tr>
</tbody>
</table>
The responsibility of a supervisor is to ensure that all the fittings provided for the use of passengers are to be in correct and good condition. Else, this invites public complaints.

Q35. What are the various activities undertaken by Indian railways to improve the condition of passenger coaching vehicles?

Answer:
Indian railways is the largest network under taking transportation of Passengers and goods. Of late importance is given to the safety and aesthetics of coaching stock. The various modifications and activities under taken to improve the condition of Rolling stock are.

- Provision of Air brakes and disc brakes
- Introduction of Composite brake blocks.
- Intensive cleaning of Coaches.
- Attention to Cleanliness on enroute trains.
- Steam cleaning of Pantry cars.
- Periodic Disinfection and pest control treatment.
- Attention of Zero missing of amenity fitting.
- Provision of shock absorbers in Primary suspension.
- Introduction of CDTS
- Introduction of Air springs
- Introduction of GPS boards

Q36. List out public complaints pertaining to the C&W branch and what are the remedial measures to be taken to avoid the complaints?

Answer:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Cause</th>
<th>Remedial measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Non-availability of water in coaches</td>
<td>Ensure full watering of all coaches at originating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stations and enroute at nominated watering stations.</td>
</tr>
</tbody>
</table>
2. Non-cleaning of coach toilets, wash basins, coach interior. Ensure intensive cleaning of toilets during PM/SM attention and proper interior cleaning of coaches. Enroute cleaning of toilets to be done at nominated stations.

3. Existence of cockroaches, insects, rats, etc. Ensure thorough periodic disinfestations of coaches.

4. Improper condition of berths, seats, snack table, door closers etc. Ensure through attention to berths, seats during ‘C’ schedule maintenance and PM/SM attention. Proper attention to be paid to the reclining mechanism of CZAC coaches, snack tables, door closures during PM/SM attention.


6. Water leakage through windows Ensure proper ceiling is provided to the window glasses of AC Coaches during the Replacement in sick line/shops.

7. Soiled Linen Ensure proper washed Linen in sufficient quantity available in the coach at originating stations.

Q37. Explain the classification of goods stock with suitable examples?

**Answer:**
Goods stock is mainly classified according to their shape of the body
1. **Open wagons:** These are used for transportation of Ores, Granite stones and some Steel products etc. which are not affected with changes in atmosphere.
   Example- BOX, BOXN, BXNR, BOXNHL etc.
2. **Covered Wagons:** These are used for transportation of food grains, sugar, cement etc. which would spoil due to changes in atmosphere like rains etc.
   Example- BCX, BCN, BCNA, BCNHL etc.
3. **Flat Wagons:** These are used for transportation of steel consignments
   Example: BFR, BRN, BRNA etc
4. **Hopper Wagons:** These are used for quick and mass transportation of food grains, coal etc. and transportation and lying of ballast for departmental use.
   Example: BOBR, BOBRN & BOBYN
5. **Container Wagons:** These are used for transportation of containers
   Example: BFKI, BLC
6. **Tank Wagons:** These are used for transportation of liquids and gases like petrol, k.oil, LPG etc.
   Example: BTPN, TP, TK, BTPGLN etc.
7. **Well Wagons:** These wagons are specially designed for carrying specific items like boilers, parts of turbines etc.
   Example: BWL
8. **Brake Van:** These are utilized by the guard of the train
   Example: BVZC, BVZI.

Q38. List out POH & ROH periodicity of various goods stock?

**Answer:**

<table>
<thead>
<tr>
<th>Sl. NO.</th>
<th>WAGON CODE</th>
<th>POH</th>
<th>ROH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1st</td>
<td>Subs</td>
</tr>
<tr>
<td>1</td>
<td>BOXN, BRN</td>
<td>6y</td>
<td>4 ½ y</td>
</tr>
<tr>
<td>2</td>
<td>BCN, BCNA, BOBR, BOBRN</td>
<td>6y</td>
<td>6y</td>
</tr>
<tr>
<td>3</td>
<td>BTPN</td>
<td>6y</td>
<td>6y</td>
</tr>
<tr>
<td>4</td>
<td>BTPGLN</td>
<td>4y</td>
<td>4y</td>
</tr>
<tr>
<td>5</td>
<td>BOY</td>
<td>3y</td>
<td>3y</td>
</tr>
<tr>
<td>6</td>
<td>BTALN</td>
<td>4 ½ y</td>
<td>4 ½ y</td>
</tr>
</tbody>
</table>
Q39. List out different types of CASNUB bogies with salient features?

Answer:
The different types of CASNUB Bogies are:

- CASNUB 22W   W – Wide jaw
- CASNUB 22W (Retro)        R–Retrofitted
- CASNUB 22W (M)                            M – Modified
- CASNUB 22NL                       N – Narrow jaw
- CASNUB 22NLB   B – Bharat & co
- CASNUB 22NLM   M – Mukund & co
- CASNUB 22HS     HS – High Speed.

These bogies are now used in – BOXN, BCN, BCNA, BRN, BTPN, BOBR, BOBRN, BOBY, BOBYN, BLC.

Bogie construction: - The bogie comprise of two cast steel side frames and a floating Bolster.

The bolster is supported on the side frames through two nests of springs. This also provides a friction damping proportional to load. Fabricated mild steel spring plank connects the side frame to maintain the bogie square. This bogie is fitted with tapered cartridge roller bearing axles.

Salient features:

- Axle load: 20.3 t, however all bogies except CASNUB 22HS now upgraded to 22.9t
- Wheel base: 2000±5 mm
- Wheel diameter: New - 1000 mm & 956 mm only for CASNUB 22WR
  Condemning – 906mm for all types
- Type of axle bearing: Standard AAR Tapered Cartridge roller Bearing (CTRB)
- Distance between journal centers – 2260 mm
- Distance between side bearers – 1474 mm
- Type of side bearer:
  -- Roller type (clearance type) – Fitted on CASNUB 22W
  -- CCMBR Pads – Fitted on CASNUB 22WR, CASNUB 22W (M),
  22NL, 22NLB, 22NLM Trolleys.
  -- Spring loaded – Fitted on CASNUB22 HS
  -- All the above side bearers are removed and P.U (Poly Urethane) pads
  are to be fitted during POH / ROH
- Type of centre pivot – IRS Type – Fitted on CASNUB 22W Trolleys.
  - Spherical type – Fitted on CASNUB 22 W (M), 22NL, 22NLB, NLM
  & 22 HS Bogies.
  - Flat pivot provided on CASNUB 22HS fitted to BCNHL, BOXNHL,
  & BLC
- Type of brake beam – Unit type fabricated brake beam
  supported and guided in the brake
  beam pocket
  -Unit type cast steel brake beam suspended
  Fitted on by hangers from side frame brackets.
  Fitted on 22W(M)
- Suspension – Long travel helical springs comprising Inner, Outer and snubber springs.
Q40. Explain ROH procedure of BOXN wagons?
Answer:

ROH OF BOXN WAGONS: -
PERIODICITY: - 18 MONTHS FOR BOXN WAGONS
24 MONTHS FOR BCN WAGONS

ROH PROCEDURE: -
I. DISMANTLING

Collect and note down PRO particulars of BOXN/BCN wagon to be attended for ROH
1. Take initial readings such as Coupler height from Rail level and note down other defects.
2. Disconnect bogie brake rigging to under frame and under frame brake gears.
3. Lift the body, run out the bogies and keep the body on trestles.
4. Strip the bogie components and insert assembly pins (12mm and 250 mm long) to retain friction shoes (Snubber wedges)
5. Raise the bolster to connect top members of side frame and remove all the outer, inner and snubber springs.
6. Remove the assembly pins and lower wedge blocks to take them out.
7. Lower the bolster to rest on the spring flank.
8. Examine bogie spring plank for cracks and check side frame alignment by trammeling Gauge as follows: -
   Wheel base – 2000 ± 5 mm
   Journal centre – 2260 ± 5 mm
   Diagonal distance of Trolley frame – 3018 ± 5 mm.
9. Take out side frame keys and adopter retaining bolts.
10. Lift side frame and spring plank assembly and release the adopters and wheel sets.
11. Slide Bolster to one side to check up the column liner plates, slope liner, Land surface, Anti rotating lugs and Bolster column with prescribed gauges and use suitable thickness Sims.
12. Check up for wear on pedestal jaw and Adopters.
13. Check up wear on Wedge.
14. Check centre pivot for cracks and wear.

ASSEMBLING OF BOGIE COMPONENTS:
1) Replace all worn out pins and bushes.
2) Replace new brake blocks.
3) Reassemble the coil springs in nest after pairing, that is in one nest the variation of free height of the springs not more than 3 mm. Mixing up of new and old springs should be avoided.
4) Check the wheel profile. If required replace the wheels with ultrasonically tested wheels.
5) Check up the side bearer rubber pads and Elastomeric rubber pads for cracks and free height, if necessary replace with new one.
6) Lower the body on the bogie after sprinkling Graphite powder in the centre pivot.
7) Check the CBC heights if necessary keep the (CBC) Buffer height pickings in between Adopter and Elastomeric pads.
8) Lubricate all the pins.
9) Replace all the worn out brake gear pins and use over hauled SAB and adjust A and E dimensions and tack weld the anchor pin.
   ‘A’ dimension must be 70 ± 2 /-0 mm.
   ‘E’ dimension must be 555 mm to 575 mm.
10) Check the CBC operating handle for any defect and free of operation.
11) Check the Draft gear, Yoke, CBC shank, Knuckles for wear and cracks if necessary replace by new ones.
12) Check hand brakes and doors for easy movement.
13) Check up Empty/Load gear arrangement and paint Yellow and Black respectively for easy identification and set the empty tie rod check nuts correctly if required.
14) Provide side frame keys.
15) Clean the Dirt collectors and Brake cylinder strainers.
16) Change the defective Air hose assembly.
17) Examine and lubricate Cut off angle cocks and change if required.
18) Examine and attend leakages of all pipes and joints.
19) Carry out the Single wagon test for proper functioning of Air brake system.
20) Carry out the medications recommended by RDSO and other authorities

Touch up paint for sole bar and stencil station and date.

Q41. What are the modifications to be carried out on wagon stock during ROH?

Answer:
1. The striker casting wearing plate is modified and secured by means of bolts and nuts with the striker casting to prevent working out of wearing plates on run.
2. A stopper is welded at an angle of 20° with the vertical on the air hose carrier suspension bracket, to prevent the excessive displacement of air hose carrier on run. This modification prevents damages to the air hoses.
3. Metallic bushes are used in the brake rigging instead of nylon bushes, to prevent frequent replacement of bushes.
4. Bulb cotters are used instead of split cotters.
5. Worn wheel profile is adopted for the RB wheels.
6. Truss beams are strengthened near brake heads by welding three numbers of MS strips to the length of 215 mm to prevent the truss beams from getting crack near the brake heads.
7. Bogie push rods are provided with safety straps on either ends to prevent the dropping of truss beams on run, whenever the pins are working out. A bolt is fitted with the floating lever to keep the bogie push rod in position, in case the pin fails.
8. Load empty horizontal lever support bracket is strengthened at the joint with the body by welding gusset plates at the joint.
9. An anti rotation lug is welded between the sleeve nut and screw rod of empty tie rod to prevent the tampering of empty tie rod.
10. Control rod diameter of SAB is increased from 28 mm to 32 mm, to prevent the control rod from getting bent.
11. An additional support bracket is given for supporting the SAB pull rod to prevent malfunctioning of SAB enroute.
12. The centre pivots are secured by means of rivets, to prevent the trolleys from getting shifted.
13. Quick couplings are used in the brake vans, to facilitate easy fitment and removal of pressure gauges.
14. For Casnub 22 W retrofitted bogie, the centre pivot bottom is cut by 5 mm at the top of the projected portion, to prevent the jamming of pivots.
15. 8mm strips are to be welded on either side hand brake wheel spindle 150mm away from sole bar to avoid accidental working out of hand brake wheel from its position when the sleeve and its riveting is defective.

Q42. What are the modifications to be carried out to convert CASNUB – 22W to CASNUB– 22WR?

Answer:
The following modifications are to be carried out to convert a CASNUB 22W into a 22 W retrofitted:
1. Introduce Elastomeric pad to the thickness of 45mm between side frame and adaptor.
2. The maximum permissible wheel diameter is to be restricted to 956mm.
3. Provide modified adaptor with reduced height of 129.5mm instead of 152.5mm.
4. Side frame key is to be reversed and should be fitted from bottom of jaw.
5. Provide constant contact rubber bonded side bearer instead of Roller type side bearer.
6. Cut the centre pivot bottom by 5mm at the top of the projected portion to prevent the jamming of pivots.

Retainer bolt hole should be shifted by 25 mm below, from the position of existing hole.

Q43. How many types of couplers are available on Indian Railways? Give their limits of Usage?

Answer:
The different types of couplers and their usage are,

<table>
<thead>
<tr>
<th>S.No</th>
<th>Type of coupling</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Screw coupling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRS Type</td>
<td>4-Wheeler wagons</td>
</tr>
<tr>
<td></td>
<td>Enhanced coupling</td>
<td>All Coaching stock</td>
</tr>
<tr>
<td>2.</td>
<td>Centre Buffer Coupler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AAR type NHT</td>
<td>8 Wheeler goods stock Vacuum braked stock</td>
</tr>
<tr>
<td></td>
<td>AAR type HT</td>
<td>8 Wheeler goods stock Air braked stock</td>
</tr>
<tr>
<td></td>
<td>Alliance II type</td>
<td>4 Wheeler goods stock</td>
</tr>
<tr>
<td>3.</td>
<td>Automatic buffer Coupler</td>
<td>MG stock</td>
</tr>
<tr>
<td>4.</td>
<td>Schaku Coupler</td>
<td>DEMU / EMU</td>
</tr>
<tr>
<td>5.</td>
<td>AAR Modified</td>
<td>LHB coaches</td>
</tr>
<tr>
<td>6.</td>
<td>Slack free Coupler</td>
<td>BLC Wagons</td>
</tr>
</tbody>
</table>
Q44. What is the buffer height? Write the standard heights for BG stock?

Answer:
The distance between Rail to Center Line of the Buffer is called Buffer Height.

Standard Buffer heights:
- **Main line coaches.**
  - Empty / Maximum: 1105 mm
  - Empty / Minimum: 1090 mm
  - Loaded / Minimum: 1030 mm

- **ICF/JESSOP DMU, EMU, MEMU, Motor coaches.**
  - Empty / Maximum: 1035 mm
  - Empty / Minimum: 1020 mm
  - Loaded / Minimum: 960 mm

- **JESSOP EMU TRAILER COACHES**
  - Empty / Maximum: 1041 mm
  - Empty / Minimum: 1026 mm
  - Loaded / Minimum: 966 mm

For BLC Wagons - BLCA: Max – 1105mm (On one side), 845 (Other side)

Q45. What are the design features and construction of CBC and name the part of CBC assembly?

Answer:

**Centre Buffer Coupler & Draft Gear**

Indian Railway uses AAR type centre buffer couplers having E-type head and F-type shank for freight stock on board gauge system. These couplers are generally as per requirements of AAR specifications M-201, M-205 and M-211.

The draft capacity of the AAR coupler depends on the strength of knuckle, which is weakest in the assembly. The yield strength of knuckle of material AAR M-201 grade ‘C’ & grade ‘E’ is 132t and 180t respectively.

**ADVANTAGES OF AAR CENTRE BUFFER COUPLER**
- Coupler and buffing gear are both located together at the centre of the wagon.
- Centre buffer coupler is identical at either end of the wagon and hence wagon direction is immaterial.
- Coupling action between wagons is automatic.
- With transition arrangement, coupling with screw coupling is possible.

**PARTS OF CENTRE BUFFER COUPLER ASSEMBLY**
- Coupler body
- Knuckle
- Knuckle pivot pin with washer
- Lock
- Knuckle thrower
- Toggle
- Universal lock lift lever connector
- Lock lift lever hook
- Lock lift rivet
- Lock lift lever rivet
- Top lifter lever rivet
- Yoke pin
- Yoke
- Yoke pin support
- Striker casting
Q46. What is Anti Creep Mechanism? Explain the procedure to check Anti creep mechanism in CBC of goods stock?

**Answer:**

**Anti Creep Mechanism:**

This is an inbuilt mechanism provided for all the CBCs’ to prevent automatic Lifting of lock on run in order to prevent train parting.

The Anti-creep mechanism in AAR coupler is provided between the Toggle and the coupler body. It is in the form of ledge on the toggle and in the form of lug in the coupler Body.

Whenever the lock gets lifted, it also lifts the lock lift assembly along with it. As the toggle moves up vertically, its anti-creep ledge, which is just below the Anti-creep lug of the coupler body hits against this anti-creep lug, thereby prevents the further lifting of lock.

**The procedure for checking anti creep mechanism:**

a. Close the knuckle.
b. Insert a bar between the lock and the knuckle tail shelf and lift the lock upwards and at the same time push the lug rearward by inserting a screw driver between the coupler body and the front of the lock hole.
c. If the lock can be raised enough to permit the opening of the knuckle, the anti-creep mechanism is defective.
d. Replace the lock lift assembly. (Toggle, Lock lift lever and Lock lift lever hook).
e. Check again.
f. Even after replacing the above, if the lock can be raised, the Anti-creep mechanism is found defective due to excessive wear on the lug of the coupler body.
g. In such a case, replace the coupler body.

Q47. How many types of bearings are there? Name the parts of tapered roller bearing?

**Answer:**

There are three types of bearings:

- CTRB (Cartridge tapered roller bearing) is used in BOXN and BCN.
- Cylindrical Roller Bearing: is used for BOXC
- Spherical Roller Bearing: is used for ICF coaches.

The parts of tapered roller bearing are:

1) Outer Race. 2) Inner Race. 3) Rollers. 4) Cage. 5) Seal. 6) spacer.

Q48. What is axle? How many types of axles are available in IR? List out parts and axle defects?

**Answer:**

Axle is a shaft made out of forging with a special contour to fix wheel disc and roller bearings on either sides. It is a very important component in safe running of train.

The different types of axles used in Indian railways are:

- 13T Axles used on BG non-AC coaches.
• 16.25T Axles used on BG AC coaches.
• 20.3 T Axles used on BG DHMU/EMU motor car and BG UIC wagons.
• 16.3T BG four wheeler wagons
• 22.9T Axles used on BG CASNUB bogies.
• 25T Axles used on BG CASNUB bogies of latest wagons.

Parts of axle:
1) Journal 2) Shoulder 3) Wheel seat 4) Axle centre

Different Axle defects are:
2. Grooved / Notched Axle.
3. Loose Axle.
4. Dent marks on the Axle.

Q49. What is Empty/Load box? Explain the it’s working?
Answer:
It is a mechanical device, which enables to provide two different leverage ratios to the brake rigging of the wagon for the empty and the loaded conditions

![Schematic Diagram of Load Empty Device](image)

**SCHEMATIC DIAGRAM OF LOAD EMPTY DEVICE**

The braking force required to stop a train within the permissible stopping distance depends on the load of the train.

- As the load increases more brake power is required, and as the load decreases less brake power is required to stop the train.
- So the brake power should be increased or decreased according to the requirement by changing the brake leverage ratio. To enable this, the ‘EMPTY-LOAD BOX’ device is provided on wagons, in between the brake cylinder and the brake blocks in the brake rigging.
- The position of the change over lever of the EL box is to be set to ensure correct brake power according to the gross weight, as given below.

<table>
<thead>
<tr>
<th>Gross Weight</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 42.5 tonnes</td>
<td>in empty position</td>
</tr>
<tr>
<td>42.5 tonnes &amp; above</td>
<td>in loaded position</td>
</tr>
</tbody>
</table>

**Brake Rigging:**
- The LOAD-EMPTY device consists of two horizontal levers (one live and the dead) which are connected by means of empty and load tie rods.
- When the handle is kept in empty position, the empty tie rod is connected with the system and in turn provides low leverage ratio, thereby gives lesser brake force.
- When the handle is kept in load position, the load tie rod is connected with the system and in turn provides high leverage ratio, there by gives higher brake force as required.
Q50. What is SAB? How many types of SABs available in rolling stock?

Answer:

SAB Stands for **SVENSKA AKTIE BOLAGOT BROMS** Regulator. This is a mechanical device provided in the brake rigging, forms part of the pull rod, for the automatic adjustment of the clearance between the brake blocks and wheels/ slack in the brake rigging. This automatically operates to shorten or lengthen the length of the pull rod, to adjust the excess or less slack in the brake rigging or brake block clearance.

This helps to maintain the clearance between the brake block and the wheels to a pre-determined constant value always, thereby maintaining the piston stroke of the brake cylinder constant. This, in turn, always maintains constant brake power for the wagon or coach on the run.

There are three types of SABs

1. DRV 450 (Used on Coaching Stock)
2. DRV 600 (Used on Air Brake goods stock)
3. DRV 750 (Used on BCNHL / BOXN HL Wagons)
   - “D” Means “Double Acting”
   - “R” Means “Rapid”
   - “V” Means “Verificative”

450 / 600 / 750 indicate capacity to lengthen / shorten the SAB pull rod.