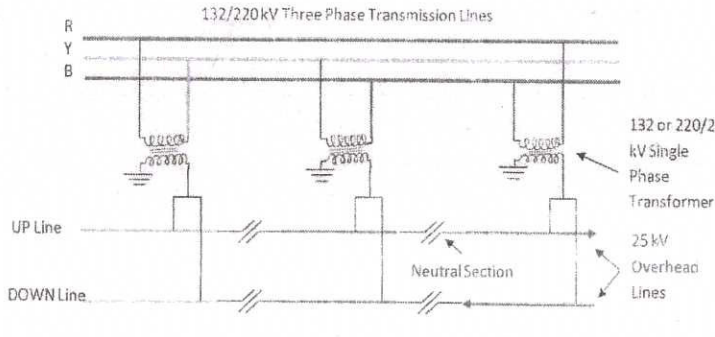


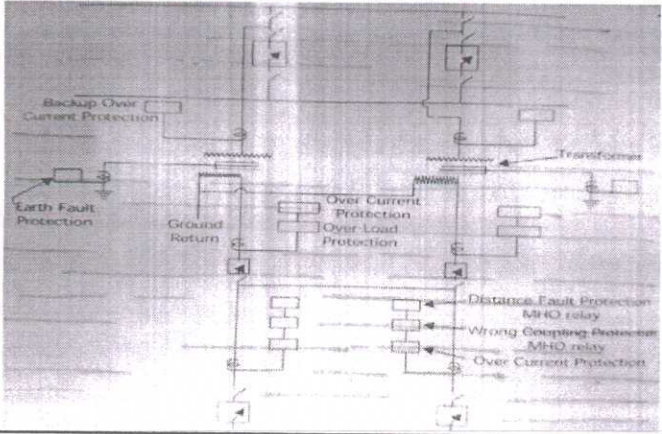
## SCHEME OF VALUATION

### (Scoring Indicators)

Revision:2010		Course Code: 5037		
Course Title: Electric Traction				
Qst No	Scoring Indicators	Split up score	Sub total	Total
I(i)	A system of electrical conductors in a generating or receiving station on which power is concentrated for distribution.	2	2	2
I(ii)	Subsection is divided into elementary sections to rapid isolate fault and to facilitate maintenance work.	2	2	2
I(iii)	The vertical (axial) distance between the catenary and contact wire is called encumbrance	2	2	2
I(iv)	<ul style="list-style-type: none"> <li>• Direct current system</li> <li>• Single phase low frequency AC system</li> <li>• Single phase high frequency AC system</li> <li>• Three phase AC system</li> <li>• Composite system</li> </ul>	1+1  (Any 2 points)	2	2
I(v)	<ul style="list-style-type: none"> <li>• Safe indication</li> <li>• Danger indication</li> <li>• Provision for automatic application of brake to the train.</li> </ul>	1+1  (Any 2 points)	2	2
II(i)		6  (Fig 6 marks)	6	6

II(ii)	<p>The slope of the contact wire with respect to rail track is called contact wire gradient.</p> <p>Contact wire gradient is very important at under bridge and OH line crossing.</p> <p>Maximum permissible slope 3mm per meter if the train speed is more than 100 KM /Hr and 4mm per meter if the train speed is less than 100 KM /Hr</p>	6	6	6
II(iii)	<p>The type of the construction of OHE to be used is primarily determined by the train speed. The effect of train speed on the current collection by the pantograph will be understood when the behavior of OHE under the passage of pantograph is followed.</p> <ol style="list-style-type: none"> <li>1. The pan of pantograph along the overhead wire pushes it up by a certain amount of pushup.</li> <li>2. The contact wire after the passage of pantograph, suddenly sags and starts vibrating vertically due to elasticity of the system.</li> <li>3. When the collecting speed exceeds 120 kmph, a contact break phenomenon is likely to occur in the overhead wire system having simple catenary system.</li> </ol>	6	6	6
II(iv)	<p>A third rail is a method of providing electric power to a railway train, through a continuous rigid conductor placed alongside the rails of a railway track.</p> <p>It may at a distance of 0.3 to 0.4 mm from the running rail.</p> <p>The conductor rail is supported on ceramic insulators or insulated brackets, typically at intervals of 10 feet (3 metres) or so.</p>	6	6	6
II(v)	<p>Cable collector</p> <p>Pole collector</p> <p>Bow collector</p> <p>Pantograph collector</p>	<p>2+2+2</p> <p>(Any 3 points)</p>	6	6

II(vi)	<p>Fixed signals</p> <p>Hand signals</p> <p>Detonating signals</p>	<p><b>3+3</b></p> <p>[Name :3 marks]</p> <p>[Explanation 3 ]</p>	<b>6</b>	<b>6</b>
II(vii)	<ul style="list-style-type: none"> <li>• DC dynamo used in traction is of totally enclosed and rugged construction so that road dust and jerks have no effect o its working.</li> <li>• Polarity of dynamo and battery should match.</li> <li>• It should give constant output at varying speeds</li> </ul>	<p><b>2+2+2</b></p> <p>(Any 3 points)</p>	<b>6</b>	<b>6</b>
III(a)	<p>Transformers.</p> <p>Interrupter.</p> <p>Circuit breakers.</p> <p>Bus bars.</p> <p>Isolating switch</p>	<p><b>4+4</b></p> <p>List any four:4marks</p> <p>Explanation: 4 marks</p>	<b>8</b>	<b>8</b>
III(b)	<ol style="list-style-type: none"> <li>1. Substations</li> <li>2. Feeding post</li> <li>3. Sectioning</li> <li>4. Sub sectioning</li> <li>5. Paralleling posts</li> <li>6. Sub sectioning post</li> <li>7. Elementary sections.</li> </ol>	<p><b>7</b></p> <p>Each carry one mark</p>	<b>7</b>	<b>7</b>

<p>IV(a)</p>	 <p>Protection system for 25 KV catenary has to fill some special requirements.</p> <p>In the case where a traction load is present on the line, and the load impedance is higher than the impedance of the feeding system, the impedance significance is analogous to that associated with the impedance values in 25 kV systems</p> <p>In the case of a short circuit, the impedance value is related to the feeding system only, but takes into account the presence of the feeder and of the catenary (both of the failure line and of the line of the system related to the second track) and the way in which such conductors are connected (in series or in parallel) through the fault and the autotransformers.</p>	<p>4+4</p> <p>Fig 4</p> <p>Explanati on:4</p>	<p>8</p>	<p>8</p>
<p>IV(b)</p>	<ol style="list-style-type: none"> <li>1. System Voltage</li> <li>2. Availability of HT grid lines</li> <li>3. Availability of land</li> <li>4. Losses in track conductor system</li> <li>5. Maximum permissible voltage drop</li> </ol>	<p>2+5</p> <p>Name : 2 marks (Explanati on 5)</p>	<p>7</p>	<p>7</p>

<p>V(a)</p>	<p>OHE includes catenary and contact wire.</p> <p>A simple polygonal type of overhead equipment is comprising of a single 65 sq. mm. size Catenary wire of Cadmium Copper and a hard drawn grooved copper Contact wire of 107 sq. mm. size suspended from the Catenary by 5 mm dia copper dropper wire spaced 9 meters apart.</p> <p>The Catenary wire comprises of 19 strands of cadmium copper, each strand of 2.10 mm dia, with overall dia of 10.5 mm having about 80% conductivity and 65 sq. mm cross-sectional area. The contact wire is a solid hard drawn grooved electrolytic copper of 12.24 mm dia and 107 sq. mm cross-sectional area. Total current carrying capacity of both wires is 600 Amps. The condemning size of contact wire is 8.25 mm.</p>	<p>2+3+3</p>	<p>8</p>	<p>8</p>
<p>V(b)</p>	<div data-bbox="363 1115 1104 1317" data-label="Diagram"> <p>The diagram illustrates a 'Modified Y-compound catenary' system. It shows a horizontal line representing the contact wire, supported by a Y-shaped structure. The Y-structure has two vertical legs that meet at a central point above the contact wire. The entire assembly is supported by two points labeled 'support' at the ends. The diagram is labeled 'Modified Y - compound catenary' and 'support' at the base.</p> </div> <p>Fig shows modified Y catenary and it's a push up. It is a combination of Y structure with compound catenary system. It has good push up and current collecting characteristics. Drawback of this construction is balancing of tension during stringing is difficult. Installation and maintenance id difficult.</p>	<p>4+3</p> <p>Fig 4</p> <p>Explanati on:3</p>	<p>7</p>	<p>7</p>

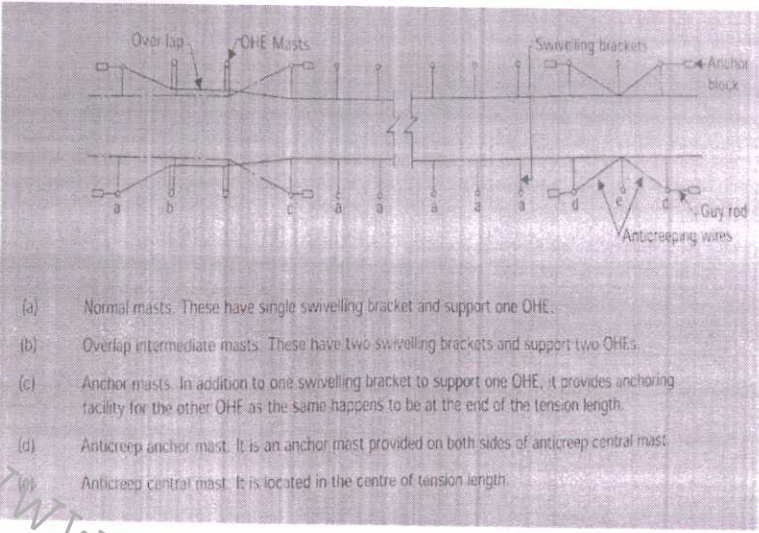
VI(a)	<p>OHE supporting structure</p>  <p>(a) Normal masts. These have single swivelling bracket and support one OHE.</p> <p>(b) Overlap intermediate masts. These have two swivelling brackets and support two OHEs.</p> <p>(c) Anchor masts. In addition to one swivelling bracket to support one OHE, it provides anchoring facility for the other OHE as the same happens to be at the end of the tension length.</p> <p>(d) Anticreep anchor mast. It is an anchor mast provided on both sides of anticreep central mast.</p> <p>(e) Anticreep central mast. It is located in the centre of tension length.</p>	4+4	8	8
VI(b)	<p>OHE maintenance schedule</p> <ol style="list-style-type: none"> <li>1. Check nut and bolt</li> <li>2. Check clearance from fixed structure</li> <li>3. Check height and stagger of contact wire</li> <li>4. Checking overlaps</li> <li>5. Cleaning of insulators</li> <li>6. Removing hard points</li> <li>7. Check performance of sectioning switches</li> <li>8. Check lubrication of moving parts</li> </ol>	7	7	7
VII(a)	<p>Two current collectors.</p> <ol style="list-style-type: none"> <li>1. Cable collector</li> <li>2. Pole collector</li> <li>3. Bow collector</li> <li>4. Pantograph Collector</li> </ol>	2+6	8	8

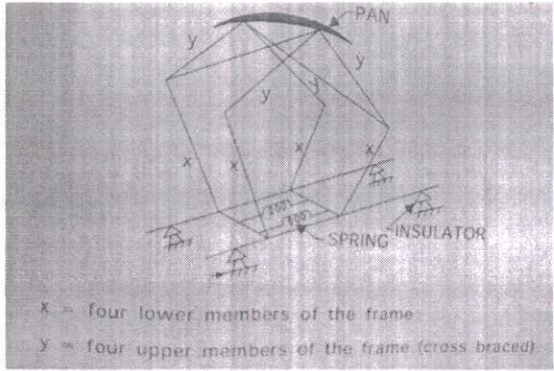
Fig 4

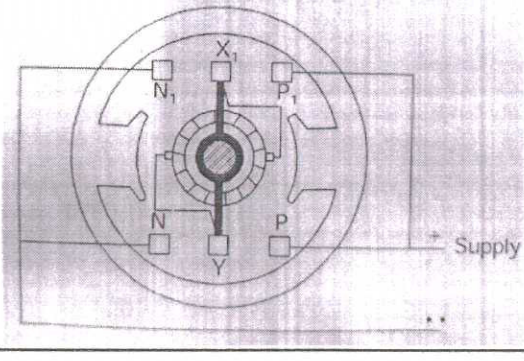
Explanati  
on:4

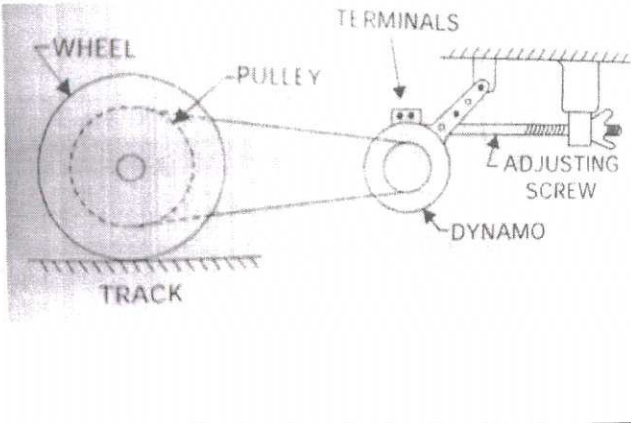
(Each  
point  
carry 1  
mark)

Name : 2  
marks

(Explanati  
on 6)

VII(b)	<p>Diamond pantograph</p>  <p>x = four lower members of the frame y = four upper members of the frame (cross braced)</p>	4+3	7	7
VIII(a)	<p>Methods of rising and lowering of pantograph</p> <ol style="list-style-type: none"> <li>1. Air raised gravity lowered</li> <li>2. Air raised spring lowered</li> <li>3. Spring raised air lowered</li> </ol>	3+5	8	8
VIII(b)	<p>Maintenance of pantograph</p> <ul style="list-style-type: none"> <li>• Connection between moving parts is provided with conductive braided wire.</li> <li>• conductive braided wire and bolt check at regular intervals</li> <li>• Static contact forces should check at regular intervals.</li> <li>• Insulators should check at regular intervals.</li> <li>• Clean at regular intervals.</li> </ul>		7	7

IX(a)	<p>Distinguish between three aspect signaling and four aspect signaling</p> <table border="1" data-bbox="375 376 1098 801"> <thead> <tr> <th>S.No.</th> <th>Three Aspect Signalling</th> <th>Four Aspect Signalling</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Red, Yellow, Green are used</td> <td>Red, Yellow, Yellow-Yellow, Green are used</td> </tr> <tr> <td>2.</td> <td>Capacity of line is more, <math>C = \frac{3600V}{(l + P + S + 2d)}</math></td> <td>Capacity of line is much more <math>C = \frac{3600V}{(l + P + S + 3 / 2d)}</math></td> </tr> <tr> <td>3.</td> <td>Driver will receive one warning before red</td> <td>Driver will receive two successive warnings before red</td> </tr> <tr> <td>4.</td> <td>Over lap is more</td> <td>Over lap is less</td> </tr> <tr> <td>5.</td> <td>Signal posts required is less</td> <td>Signal posts required is more</td> </tr> </tbody> </table>	S.No.	Three Aspect Signalling	Four Aspect Signalling	1.	Red, Yellow, Green are used	Red, Yellow, Yellow-Yellow, Green are used	2.	Capacity of line is more, $C = \frac{3600V}{(l + P + S + 2d)}$	Capacity of line is much more $C = \frac{3600V}{(l + P + S + 3 / 2d)}$	3.	Driver will receive one warning before red	Driver will receive two successive warnings before red	4.	Over lap is more	Over lap is less	5.	Signal posts required is less	Signal posts required is more	2+2+2+2	8	8
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IX(b)	<p>The advantages of colour light signals.</p> <ol style="list-style-type: none"> <li>1. Economy</li> <li>2. Simplicity of indication to drivers</li> <li>3. Better ability to deal with traffic of varying speed.</li> <li>4. Better control</li> <li>5. Easy operation</li> <li>6. Manage heavily worked stations</li> <li>7. Increased line capacity</li> </ol>	7	7	7																		
X(a)	<p>Method of obtaining unidirectional polarity. Unidirectional polarity generator</p> 	4+4	8	8																		

X(b)	Traction dynamo method of obtaining constant output irrespective of speed.	4+3	7	7
		Fig 4	Explanation: 3	

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