Course No: CE F425   **Date: 07-03-2017 [9 AM start]**
Duration: 90 Mins (Closed book)   **Max. Marks: 70**

I: Choose the best answers: [10 x 1=10]

1. Fixed heel type of switches are inferior to loose heel type of switches (True/False)
2. Curve lead is the distance between the tangent point and the actual nose of crossing (True/False)
3. Tongue rails are to be made lighter than stock rails in case of over-riding switch arrangement (True/False)
4. The only kink that cannot be removed is the kink located at the heel of the switch (True/False)
5. The number of sleepers per km length of a typical broad gauge track of sleeper density M+4 is _____
6. Excess super-elevation may lead to overturning of empty goods rolling stock when exposed to high winds (True/False)
7. Transition curve permits a gradual decrease of super elevation along the length, so that full super elevation is attained in line with the curvature. (True/False)
8. Diesel engine is capable of producing high power at start and hence does not require the clutch and gear box. (True/False)
9. Prime quality rails and industrial rails differ in mechanical properties of steel section (True/False)
10. Rail joints are lubricated to facilitate the expansion of rail and to retard wear on the fishing planes of the rail and fishplates. (True/False)

II: Short answers   [10 x 2 = 20]

1) Welding of rails in long lengths was technically disinteresting. Discuss
2) Explain the two possibilities of derailment on curves. What is the general slope of wheel cone?
3) What are the factors affecting the durability of rail section?
4) Why vertical stiffness of the rail section is important? To which type of durability vertical stiffness is strongly linked to?
5) Define the number of crossing adopted as per Indian Standards
6) Define throw of switch.
7) What are the functions of check rail?
8) Draw the rail seat with spikes' position and rail positions.
9) Mention the composite strength index specified by Indian Railways for track sleeper and crossing sleepers.
10) Explain RCF.

III: Long answers: [40 marks]

1) If an 8-degree curve track diverges from a main curve of 5 degrees in an opposite direction in the layout of B.G. yard, calculate the super elevation and the theoretical speed of the branch line, if the maximum speed permitted on the main line is 45 kmph. The maximum value of cant deficiency prescribed by Indian Railways for B.G. is 76 mm (for speed up to 100 kmph) and 10 mm (for speed more than 100 kmph). It is also specified that the negative super elevation to be provided on the

branch track is same as the maximum super elevation permitted on the main curved track (after incorporating the permitted cant deficiency). What is the problem associated with the contrary flexure scenario as visualized in this problem? [15]

2) Calculate all the necessary elements required to set out a 1 in 8.5 turnouts, taking off from a straight B.G, track with its curve starting from the toe of the switch, i.e. tangential to the gauge face of the outer mail rail and passes through TNC. Heel divergence can be taken as 11.0 cm. Use appropriate method. Identify the kinks present in this case. Draw the typical crossing arrangement of a turnout depicting stock rails, tongue rails, check rails, switches and crossing positions. [10]

3) A 500 m radius curve is introduced between two tangent portions of BG lines intersecting to form a deviation angle of 80 degrees. The booked speed for goods train in the section is 50 kmph and the maximum sanctioned speed is 100 kmph. Calculate the equilibrium cant, maximum permissible speed, length of transition curve, shift and the offsets for setting out the transition curve. The chainage at the point of intersection can be taken as 1000 m. [20]