

B.E. Civil Engineering – Third Year – Second Semester Exam - 2024
Transportation Engineering - I (Old)

Time: 3 Hours

Full Marks: 100

Answer brief & to the point. Assume standard value for any parameter, if required

1. Answer the following questions in brief 5 x 6
 - a. Mention the criteria for choice of subsurface drainage filter
 - b. Apart from the rail length, name four other factors which influence the calculation of sleeper density.
 - c. Define Building Line & Control Line
 - d. Define Cant deficiency and Cant excess in railway engineering
 - e. Explain the relation between depth of ballast cushion and sleeper characteristics
 - f. Weaving Length & Weaving Angle

 2. Write short note on / explain the following: 5 x 6
 - a. PIEV Theory
 - b. What is the compensated grade for a 200m radius horizontal curve in a longitudinal slope of 5%?
 - c. Minimum Longitudinal Gradient on highway
 - d. Necessity of Gauge Uniformity
 - e. Railway Gradients
 - f. Negative Super Elevation

 3. Calculate the super elevation and the maximum permissible speed for a 2° BG curve on a high-speed route with a maximum sanctioned speed of 110 km/h. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 80 km/h and the booked speed of goods trains is 50 km/h. [8]

 4. A BG branch line track takes off as a contrary flexure through a 1 in 12 turnout from a main line track of a 3° curvature. Due to the turnout, the maximum permissible speed on the branch line is 30 km/h. Calculate the negative super elevation to be provided on the branch line track and the maximum permissible speed on the main line track (when it takes off from a straight track) [8]

 5. Pair of longitudinal rectangular 300mm wide open cut side drains runs adjacent to the shoulders of a 2-lane 2-way divided highway having 3m wide shoulders on both sides. A 20m wide grassy land is sloped towards the other side of the drain. The catchment area has a length of 500m along the length of the road. The average runoff coefficients are 0.45, 0.35 and 0.25 for bituminous carriageway, compacted shoulder and grassy land respectively. The inlet time from the furthest point to the drain is 11.25min and the rainfall intensity for design return period is 115mm/hr for 19min duration and 130mm/hr for 20min duration. Design the drainage system considering Manning's roughness coefficient 0.022, speed of flow 0.8 m/sec. and free board of 0.14m. [8]

 6. Determine the length of minimum overtaking zone for a 4-lane 2-way undivided highway with design speed of 80Kmph. State how this length can be further reduced without changing the design speed and determine what will be the length of overtaking zone in that case. For both cases, assume maximum speed of overtaken vehicle 64Kmph, reaction time for overtaking 2secs, acceleration of overtaking vehicle 3.6Kmph/sec. [8]

 7. Design the super elevation, transition length and extra width required for a horizontal curve at a flat section of a highway. Consider, maximum super-elevation of 7% provided about centre line at a rate of 1 in 120; maximum coefficient of lateral friction = 0.15; length of rigid wheel base = 6m; Design speed = 80Kmph, reaction time for braking = 2.5secs, coefficient of braking friction = 0.34, braking efficiency = 90%, maximum speed of overtaken vehicle = 64Kmph, reaction time for overtaking = 2secs, acceleration of overtaking vehicle = 3.6Kmph/sec. [8]
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