

**B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER SUPPLEMENTARY EXAM
2024
TRANSPORTATION ENGINEERING I**

Time: 3 Hours

Full Marks: 100
[50 Marks for each part]

Part I

Use Separate Answer scripts for each Part

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

Answer ALL the Questions

1. Explain the following and highlight the influence of each in the highway geometric design – 5×6
- a. Capacity and Level of Service as modified in Highway Capacity Manual
 - b. Field of Vision
 - c. PCU
 - d. Height characteristics of vehicle
 - e. Power Loss of Vehicles
- [CO2]

Group: II [CO5]

2. Compute the design traffic for a flexible pavement section for a dual 4-lane carriageway street AB following IS:37-2018; with annual growth rate of 5%, design life of 20 years from present day and Lane Distribution Factor as 45%.

Single Axle Single Wheel Load (kN)	80	60	50	30
Traffic Volume in veh/day (A to B)	600	1000	9250	9400
Traffic Volume in veh/day (B to A)	550	1250	9150	10600

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3. Following the IRC recommended method, design the position of longitudinal joints for a rigid pavement considering Design Wheel Load= 8.1t, Width of Expansion Joint Gap= 25mm, Maximum variation in temperature between summer and winter= 35°C, Modulus of Sub-grade reaction= 8kg/cm³, Width of Slab= 3.5m, Coefficient of Surface Friction= 1.5, Radius of Equivalent Contact Area= 15cm, Modulus of Elasticity of Concrete= 3×10⁵kg/cm², Thermal Coefficient of Concrete= 1×10⁻⁵/°C, Unit Weight of Concrete= 2400kg/cm³, Poisson Ratio of Concrete= 0.15, Flexural Strength of Concrete= 40kg/cm², Tensile Strength of Concrete= 0.8kg/cm², Bearing Strength of Concrete= 100kg/cm². The following expressions may be used–

$$L_c = \frac{2 \times 10^4 f_c}{\gamma_c H} \quad \text{and} \quad L_e = \frac{\delta}{200 \times T_c t_s}$$

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[Turn over

B.E. CIVIL ENGINEERING EXAMINATION 2024
 [3rd Year; 1st Semester Supplementary Examination]
Transportation Engineering - I

Total Time: Three Hours

Full Marks 100
 (Part I: 50 + Part II: 50)

Use a separate Answer-Script for each part

Part II (50 Marks)

Answer All: (10 × 5 = 50)

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| 1 | The radius of a horizontal circular curve is 100 m. The design speed is 50 kmph and the design coefficient of lateral friction is 0.15. | CO3 |
| | a) Calculate the superelevation required if full lateral friction is assumed to be developed.
b) Calculate the coefficient of friction needed if no superelevation is provided
c) Calculate the equilibrium superelevation if the pressure on inner and outer wheels should be equal | |
| 2 | When 'Widening of Pavement' is required on Horizontal Curves? Derive the necessary expression for the same explaining every steps in details. | CO3 |
| 3 | List and explain the 10 major test conducted on bitumen. Describe their uses and importance in the field applications. | CO4 |
| 4 | What are the component of a 'highway project report'? Mention and explain the 'Basic Requirements' of an ideal highway alignment between two terminal stations. | CO1 |
| 5 | Write the methods in details for the 'Attainment of Superelevation? What is c'Compensation in Gradient' on Horizontal Curves? Mention the importance of 'Set-back Distance' on Horizontal Curves. | CO3 |