40+40+5 (95)

T.E Civil - V 'C' 01.12.23

Time: 3hrs **Total Marks:80**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any **3** questions out of the remaining **5**.
(3) All questions carry equal marks.
(4) Assume suitable data, and support all theory with neat sketch, wherever required.

1. Attempt any FOUR **[20]**
   - **a.** What is grade compensation? Where is it provided on a highway?
   - **b.** Describe the term 'Equivalent Wheel Load Factor'. How does an increase in wheel load affect the damaging factor?
   - **c.** Explain how PIEV theory is used to evaluate reaction time.
   - **d.** What are the types of failures in flexible pavement?
   - **e.** Sketch the layout of an Airport, properly marking all the components.
   - **f.** Why is soil stabilization required? What are its different methods?

2. **a.** Enlist the different types of traffic studies and explain any one in detail. **[10]**
   b. What is stopping sight distance? Calculate the safe stopping sight distance for a design speed of 70 kmph for two-way traffic on a single-lane road, if the coefficient of friction is given as 0.37 **[10]**

3. **a.** Mention any one test for determining the grade of bitumen. Explain the test. **[10]**
   b. (i) What are the basic requirements of a highway alignment? **[10]**
   (ii) The design speed on a highway is 80 kmph, the pavement width is 10m and the length of the wheelbase is assumed as 6m. If a horizontal curve of radius 480m is to be provided on this highway, design the geometric features – (i) super elevation, (ii) Extra widening

4. **a.** (i) What is the significance of CBR value and modulus of subgrade reaction on the design of pavements? **[10]**
   (ii) Explain the term 'cumulative standard axle'? Write down the formula for CSA and explain all the terms

   b. Define Equilibrium cant. **[10]**
   Calculate the value of equilibrium cant for a 3° curve on a BG track having a design speed of 95 kmph. What is the maximum permissible speed on the track, allowing maximum cant deficiency?

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5. **a.** (i) Explain BBD for structural evaluation of pavements **[10]**
(ii) Write a note on drainage systems in pavements.

b. Using Westergaard's equations, calculate the wheel load stresses at (i) interior, (ii) edge and (iii) corner regions of a rigid pavement, from the given data. Determine the location where a crack is likely to develop due to corner loading. Given, P= 6500 kg, E= 3 x 10^5 kg/cm^2, μ= 0.15, K= 6 kg/cm^3, radius of contact area, a= 15cm and pavement thickness, h=18 cm **[10]**

6. **a.** Explain QVK curve and LOS (level of service) with suitable figures. **[10]**

b. Find out the corrected length of runway for an airport at an elevation of 200m RL, if the basic runway length is 600m. The airport reference temperature is 27^{0}C and the maximum elevation difference along the profile of the runway is 5.6 m. **[10]**