Reg No.: _____ Name: _____

JYOTHI ENGINEERING COLLEGE LEAD KINDLY LIGHT (AUTONOMOUS) CREATING TECHNOLOGY LEADERS OF TOMORROW ESTD 2002

Jyothi Engineering College(Autonomous)

M.Tech Degree S1 (R) Examination, December 2025 (2025 Scheme)

5/1/26

25PTET103- ANALYSIS AND DESIGN OF PAVEMENT SYSTEMS

Total Mark: 60 Total Time: 2hr 30min

CO MARK

(Use of relevant IRC codes and Charts/Tables are permitted)

PART A

Answer All Questions

1. Differentiate between flexible and rigid pavements. Illustrate why flexible pavements require thicker layers than rigid pavements. CO1 (5)
2. Explain how Burmister two layer theory is applied in design of flexible pavements. CO2 (5)
3. Give IRC design guidelines for flexible pavement design. CO3 (5)
4. Discuss the nature of load and temperature induced stresses in a concrete slab during day time and night time. Which condition is considered to be critical in pavement design? CO4 (5)
5. With neat sketches, illustrate dowel group action at the edge of CC pavement. CO5 (5)

PART B

Answer Any Five Question(s)

6. Explain the Marshall Mix design Procedure. Plot the trends of the parameters in Marshall mix design. Give the standard specifications. CO1 (7)
7. Define Vehicle damage factor. Determine the EWLF or VDF value of the following axle loads in terms of the standard axle load of 8.16t. (i) LCV with rear axle load of 2.5 t (ii) HCV with rear axle load of 15 t. CO1 (7)
8. A plate bearing test using a 75cm plate was made on a subgrade as well as on 26cm of gravel base course. Unit load required to cause settlement of 0.5cm was $0.67 kg/cm^2$ and $2.67 kg/cm^2$respectively. Determine the required thickness of base course to sustain 25000kg, $6.67 kg/cm^2$ pressure and maintain a deflection of 0.5cm. CO2 (7)
9. A particular highway section requires a new pavement. The design period for the highway is 20 years. Due to uncertainty in traffic growth along the highway corridor, a 2 stage construction was planned with each stage being 10 years long. A pavement structure consisting of a HMA layer over a 12 inch untreated aggregate base was chosen for the highway. The resilient modulus at the construction site is 10000 psi. A traffic surveyed showed that the annual average daily truck traffic in the highway is currently 200 with an average truck factor of 2. The survey also found that the traffic is equally distributed in both directions and the design lane carried 60% of the total traffic in each direction. Assuming a traffic growth rate of 5% per annum and a limiting damage ratio of 0.6 at the end of the first stage, determine the thickness of HMA layer to be placed in each stage. (Assume a surface course of 2 inch thickness.) CO3 (7)

10. Briefly outline IRC procedure for determining the thickness of cement concrete pavement. CO4 (7)

11. Determine the warping stress at interior, edge and corner of a rigid pavement with transverse joints at 10m interval and longitudinal joints at 3.75m interval. Temperature differential condition for 4 days is to be 0.6°C/cm slab thickness. Width of slab= 3.75m, Thickness of CC pavement 200mm, Thermal expansion of concrete is equal to $10 \times 10^{-6}/°C$. E of concrete $3 \times 10^5 kg/cm^2$, Modulus of subgrade reaction is $6.9 kg/cm^3$, Radius of loaded area=15cm, Poisson's ratio of concrete is 0.15. CO4 (7)

12. A cement concrete pavement has a thickness of 18 cm and has two lanes of 7.2m with a longitudinal joint along the centre. Design the dimensions and spacing of the tie bar. Allowable working stress in tension = $1400 kg/cm^2$, Unit weight of concrete = $2400 kg/m^3$, Allowable bond stress in deformed bars in concrete= $24.6 kg/cm^2$ and coefficient of friction = 1.5. CO5 (7)

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