CBCS SCHEME

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15CV833

Eighth Semester B.E. Degree Examination, June/July 2024
Pavement Design

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Briefly explain the Pavement Components and functions of components. **(04 Marks)**

b. Write comparison between Flexible and Rigid Pavement. **(04 Marks)**

c. Explain briefly Design factors to be considered in the design of pavement. **(08 Marks)**

2 a. List and briefly explain the assumptions and limitations of Bousinerq's theory. **(08 Marks)**

b. Design the thickness of a flexible pavement by Bunmister's two layer analysis for a wheel load of 40 kW and a tyre pressure of 0.5 MN/m^2. The modulus of elasticity of the pavement materials is 150 MN/m^2 and that of the subgrade is 30 MN/m^2. **(08 Marks)**

Module-2

3 a. What are the design factors considered in the design of pavement? Explain any three in detail. **(08 Marks)**

b. Calculate the design repetition for 20 years period for various wheel loads equivalent to 22.68kN. Wheel load using the following data on a four lane road. **(08 Marks)**

Load kN	22.68	27.22	31.75	40.82	45.36	49.90	54.43
Volume per day	30	25	20	15	10	5	1

4 a. Explain the significance of ESWL in pavement design. **(08 Marks)**

b. It is proposed to widen an existing 4 lane NH section to 3 lane dual carriage way road. Design the pavement for new carriage way with following data:
Initial traffic in both directions = 4932 CVPD ; Construction period = 20 months
Design life = 15 years ; Design CBR of soil = 7%
Traffic growth rate = 8% ; VDF = 4.5.
Land distribution factor = 75% (0.75)

Pavement Design Catalogue
Plate 2- Recommended Designs for Traffic Range 10-150 msa

CBR 7%				
Cumulative traffic (msa)	Total pavement thickness (mm)	Pavement Composition		
		Bituminous Surfacing		Granular base and sub-base (mm)
		BC (mm)	DBM (mm)	
10	580	40	60	
20	610	40	90	
30	630	40	110	Base = 250
50	650	40	130	
100	575	50	145	Sub-base = 230
150	695	50	165	

(08 Marks)

Module-3

5 a. Explain typical failures of flexible pavement. **(08 Marks)**

b. Briefly explain the various maintenance works of bituminous surfaces. **(08 Marks)**

6 Write notes on:

a. Roughness measurement **(04 Marks)**

b. Falling Weight Deflectometer **(04 Marks)**

c. Benkelman beam deflection method **(08 Marks)**

Module-4

7 a. Write Westergaard's load stress equations at critical regions and discuss critical combination of stresses. **(08 Marks)**

b. Explain IRC recommendation's is the design of dowel bar, tiebar and RCC in pavements. **(08 Marks)**

8 a. Calculate wheel load stresses at interior, edge and corners using Westergaard's equations for wheel load = 51kN, tyre pressure = $0.75N/mm^2$, E = $30kN/mm^2$, K = $0.08N/mm^2$ slab thickness 250mm. **(08 Marks)**

b. A cement concrete pavement has a thickness of 20cm on a 2 lane road of 7.5m with a longitudinal joint along the centre. Design the dimensions and spacing of tie bars for the following data. Working stress in tension S_s = 1400 kg/cm^2 density of concrete W = $2500kg/m^3$, friction coefficient 1.5. Allowable bond stress in concrete, Sb = $24.6kg/cm^2$. **(08 Marks)**

Module-5

9 a. What are the factors considered in design of rigid pavements? Explain any three factors. **(08 Marks)**

b. List the typical failures in rigid pavements and explain any three of them. **(08 Marks)**

10 a. With sketches, describe the various types of joints and their requirements, in rigid pavements. **(08 Marks)**

b. Determine spacing between contraction joints for a 3.5m slab width having thickness of 200mm, friction 1.5, for the following two conditions:

i) Planche cement concrete, allowable Sc = $0.08\ N/mm^2$

ii) Reinforced cement concrete, 10mm diameter bars at 0.3m spacing. **(08 Marks)**

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