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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Civil Engineering

Semester End Examination; July / Aug. - 2022

Pavement Analysis and Design

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1 - Apply the knowledge of science and engineering to acquire the fundamentals of various factors affecting design and performance of pavements

CO2 - Calculate the stresses and deflection in flexible pavements.

CO3 - Calculate the stresses and deflection in rigid pavements.

CO4 - Design flexible and rigid pavements.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.		Questions	Marks	BLs	COs	POs
		I : PART - A	**10**			
I	a.	What are the factors affecting pavement design?	2	L1	CO1	1,3
	b.	Write the vertical stress equation for a uniformly distributed circular load based on Boussinesq's theory.	2	L1	CO2	3
	c.	What is the critical combination stresses during winter at both edge and corner region?	2	L1	CO3	3
	d.	What is the VDF for rolling terrain and plain terrain?	2	L1	CO3	3
	e.	What are wraping stresses?	2	L1	CO4	3,4
		II : PART - B	**90**			
		UNIT - I	**18**			
1	a.	Sketch a typical flexible pavement cross-section. Mention the functions and importance of each of the components.	9	L2	CO1	1,3
	b.	Explain the desirable characteristics of the pavement.	9	L2	CO1	1,3
	c.	Explain ESWL concept. Mention the various factors affecting the ESWL. State the importance of ESWL.	9	L1 L3	CO1	1,3
		UNIT - II	**18**			
2	a.	Distinguish between the Boussinesq's single layer theory and Burmister's two layer theory.	9	L3	CO2	3,6
	b.	Plate bearing test conducted with 30 cm dia plate on a subgrade soil sustained a load of 600 kgs at 0.25 cm deflection. The test when carried out on a base course of thickness 1cms sustained a load of 2000 kgs at 0.25 cm deflection. Design the pavement thickness for a wheel load of 5000Kgs with tyre pressure of 7 kg/cm^2 using Burmister's two layer approach. Consider the design deflection as 0.5 cm. Use chart.	9	L3	CO2	3,6

Contd… 2

c.	How are the stresses and strain evaluated by three layer theory? Illustrate a neat sketch for the same.	9	L3	CO4	2,3,6
	UNIT - III	**18**			
3 a.	Explain McLeod method of highway pavement design.	6	L3	CO4	2,3,6
b.	Explain briefly the CBR method of flexible pavement design as per IRC guidelines and explain the advantages of CBR method.	12	L2	CO4	2,3,6
c.	Design the pavement for the construction of new bypass with the following data: Two lane single carriage way = 400 Cv/day Initial traffic in the year of completion = sum of both the direction Traffic growth rate per annum = 7.5% Design life = 15years VDF = 2.5 Design CBR of subgrade soil = 4%	12	L4	CO4	2,3,6
	UNIT - IV	**18**			
4 a.	Explain briefly how the following factors effect design of cement concrete pavements: i) Wheel load and its repetitions ii) Subgrade strength and its properties iii) Properties of concrete iv) Temperature variations	9	L3	CO3	3,6
b.	Determine the wraping stresses at interior, edge and corner regions in a 25 cm thick concrete pavement with transverse joints at 11 m interval and longitudinal joints at 3.6 m intervals. The modulus of subgrade reaction (k) is 6.9 kg/cm^2. Assume temperature differential for day conditions to be 0.6°C per cm slab thickness. Assume radius of loaded area as 15 cm for computing wraping stress at the corner. Additional data are given below, $\varepsilon = 3\times10^5$ kg/cm^2, $e = 10\times10^{-6}/^{\circ}$C, $\mu = 0.15$.	9	L3	CO3	3,6
c.	Explain warping stress and frictional stresses.	9	L3	CO3	2,3,6
	UNIT - V	**18**			
5 a.	Explain the types of joints in CC pavements and their functions.	9	L3	CO4	2,3,6
b.	Explain the design considerations for spacing of, i) Expansion joints ii) Contraction joints with and without reinforcement	9	L3	CO4	2,3,6
c.	What is white topping? Mention its advantages and disadvantages.	9	L3	CO4	2,3,6

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