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10CV833

Eighth Semester B.E. Degree Examination, June/July 2018
Pavement Design

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. What are the different layers of flexible pavements? Explain the functions of each. **(08 Marks)**

b. Bring out the points of difference between highway and airfield pavements. **(06 Marks)**

c. List the various factors to be considered for the selection of type of pavement. Also list the factors affecting pavement performance. **(06 Marks)**

2 a. Explain Frost action. What are the measures adopted to reduce it's effects. **(06 Marks)**

b. State the assumptions and limitations of Elastic Single layer theory and Burmister's two layer theory. **(06 Marks)**

c. The plate bearing tests were conducted with 30 cm plate diameter on soil subgrade and over 45 cm base course. The pressure yielded at 0.5 cm deflection are 1.25 kg/cm^2 and 8 kg/cm^2 respectively. Design the pavement section for 5100 kg wheel load with tyre pressure of 7 kg/cm^2 for an allowable deflection of 0.5 cm using Burmister's approach. (Refer chart given for Burmister's two layer deflection factors in Fig. Q2 (c)) **(08 Marks)**

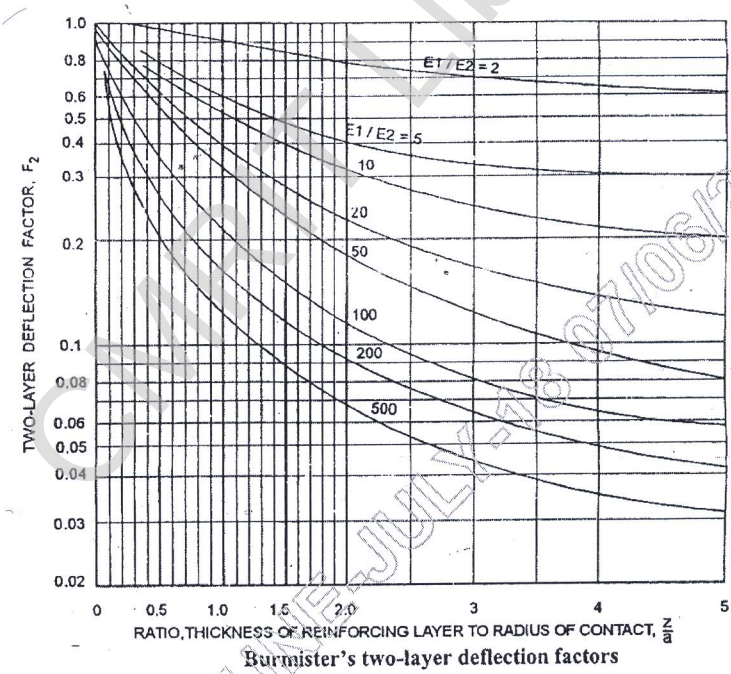

Fig. Q2 (c)

3 a. Calculate the ESWL of a dual wheel assembly carrying 2044 kg each for pavement thickness of 15 cm, 20 cm and 25 cm. Centre to centre tyre spacing is 27 cm and distance between the walls of the tyre is 11 cms (Use Graphical Method). **(10 Marks)**

b. Calculate the design repetitions for 20 year period for various wheel loads equivalent to 22.68 kN wheel load using the following data on a four lane road. **(10 Marks)**

Load in 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
EWLF	1	2	4	8	16	32	64

4 a. Design the pavement section by triaxial-Kansas method using the following data:
Wheel load – 41 KN
E value of base course = 40 N/mm^2
E value of subgrade soil = 10 N/mm^2
E value of wearing course = 100 N/mm^2
Radius of contact area = 150 mm
Design deflection = 2.5 mm
Sketch the pavement section. **(10 Marks)**

b. Briefly explain the procedure of CSA method for the flexible pavement, design as per IRC-37-2001. **(10 Marks)**

PART – B

5 a. Define modulus of subgrade reaction and radius of relative stiffness. **(06 Marks)**

b. Write the commonly used equations for the theoretical computation of wheel load stress by Westergaard's analysis of Interior; Edge and corner loadings. **(06 Marks)**

c. Calculate the stresses at interior, Edge and corner regions of a cement concrete pavement using Westergaard's stress equation. Use the following data:
Wheel load = 5100 kg ; E = 3×10^5 kg/cm^2 ; μ = 0.15; Pavement thickness = 18 cm
Modulus of subgrade reaction = 6 kg/cm^3; Radius of contact area = 15 cm **(08 Marks)**

6 a. List the various requirements of joints in cement concrete slabs. Explain in detail with sketches: (i) Expansion joints. (ii) Contraction joints. **(10 Marks)**

b. A CC pavement has thickness of 18 cm and has two lanes of 7.2 mts with a longitudinal joint along the centre. Design the dimensions and spacings of the tie bar. The other data are –
allowable working stress in tension – 1400 kg/m^2
Unit weight of concrete – 2400 kg/m^3
Coefficient of friction – 1.5
Allowable bond stress in deformed bars in concrete – 24.6 kg/m^2. **(10 Marks)**

7 a. Benkelman beam deflection studies were carried out on 15 selected points on a stretch of flexible pavement during summer season using a dual wheel load of 4085 kg at 5 kg/cm^2 pressure. The deflection values obtained in mm after making the necessary lag corrections are given below. If the present traffic consists of 750 commercial vehicles per day, determine the thickness of bituminous over lay required. If the pavement temperature during the test was 39°C and the correction factor for subsequent increase in subgrade moisture content is 1.3. Assume annual rate of growth of traffic as 7.5%. Adopt IRC guideline. 1.40, 1.32, 1.25, 1.35, 1.48, 1.60, 1.65, 1.55, 1.45, 1.40, 1.36, 1.46, 1.50, 1.52, 1.45 mm **(14 Marks)**

b. What are the causes of formation of waves and corrugations in flexible pavements? Suggest remedial measures. **(06 Marks)**

8 a. Explain various types of rigid pavement failures with neat sketches. **(10 Marks)**

b. Explain briefly the pavement evaluation. **(10 Marks)**

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