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10CV833

Eighth Semester B.E. Degree Examination, June/July 2015
Pavement Design

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of specified charts and tables is permitted.***

PART – A

1 a. With a neat sketch of pavement cross section (flexible type), explain the various components and briefly bringout their functions. **(10 Marks)**

b. Briefly explain the desirable characteristics of pavement. **(05 Marks)**

c. Bring out the differences between highway pavements and air field pavements. **(05 Marks)**

2 a. Explain briefly the factors affecting pavement design. **(08 Marks)**

b. A plate load test conducted with 0.3 m diameter plate on subgrade and on a pavement of thickness 0.4 m sustained pressure of 0.10 MN/m^2 and 0.40 MN/m^2 respectively at 5 mm deflection. Design the pavement section for 50 kN wheel load and contact pressure of 0.70 MN/m^2 for an allowable deflection of 8 mm using Burmisten's approach. If you want to maintain the deflection of 6.5 mm, what would be the required thickness? Use the chart in Fig. Q2 (b). **(12 Marks)**

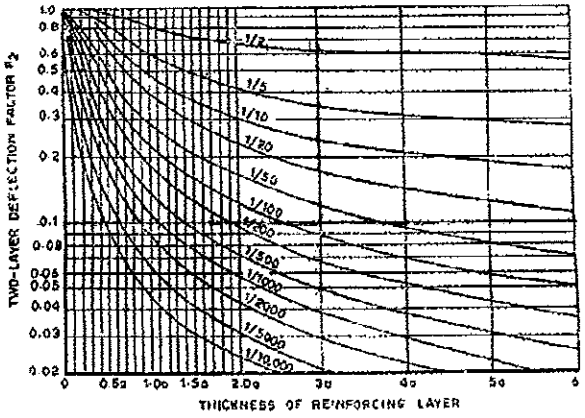

Fig. Q2 (b)

3 a. Calculate the ESWL of a dual wheel assembly carrying 2044 kg each for pavement thickness of 150 mm, 200 mm and 250 mm. Centre to centre tyre spacing is 270 mm and distance between the walls of the tyres is 110 mm. **(10 Marks)**

b. Calculate the design repetions for 20 years for various wheel loads equivalent to 2268 kg wheel load using the following traffic survey data on a four lane road. The average daily traffic in both the directions was 215. **(10 Marks)**

Wheel load (kg)	2268	2722	3175	3629	4082	4536
Percentage of total traffic volume (%)	13.17	15.30	11.76	14.11	6.21	5.84

4 a. Explain Mcleod's method of highway pavement design with the help of appropriate charts. **(08 Marks)**

b. Design the pavement section by triaxial test method using the following data:
Wheel load - 4100 kg ; Radius of contact area - 15 cm; Traffic coefficient, X - 1.5,
Rainfall coefficient, Y - 0.9, Design deflection, Δ - 0.25 cm;
E value of subgrade soil, $E_s = 100 kg/cm^2$
E value of base coarse material, $E_b = 400$ kg/cm^2
E value of 7.5 cm thick bituminous concrete surface course = 1000 kg/cm^2 **(12 Marks)**

PART – B

5 a. Explain the following:
i) Modulus of subgrade reaction.
ii) Relative stiffness of slab to subgrade.
iii) Equivalent radius of resisting section. **(10 Marks)**

b. Determine the warping stresses at interior, edge and corner regions in a 25 cm thick concrete pavement with transverse joints at 11 m intervals and longitudinal joints at 3.6 m intervals. The modulus of subgrade reaction (K) is 0.069 N/mm^3. 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 warping stress at the corner. Take $e = 10 \times 10^{-6}$ per°C, E = 0.3×10^5 N/mm^2 and $\mu = 0.15$. Use the chart in Fig. Q5 (b) **(10 Marks)**

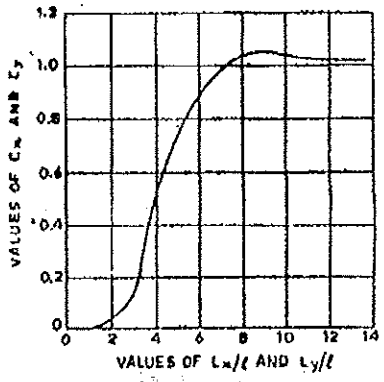

Fig. Q5 (b)

6 a. Write a brief note on spacing of expansion and contraction joints. **(06 Marks)**

b. Design the size and spacing of dowel bars at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm, for a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load. Joint width is 2 cm, permissible shear and flexural stresses in dowel bar are 1000 and 1400 kg/cm^2 respectively and permissible bearing stress in CC is 100 kg/cm^2. **(14 Marks)**

7 a. Explain any four typical flexible pavement failures. **(08 Marks)**

b. 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, 5.6 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 overlay 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 guidelines 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 and 1.45 mm. **(12 Marks)**

8 Write short notes on any four of the following:
a. Rigid pavement failure.
b. Maintenance measures in rigid pavements.
c. Functional evaluation by visual inspection.
d. Uneven measurements.
e. Design factors for runway pavements.
f. Design methods for airfield pavements. **(20 Marks)**

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