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10CV833

Eighth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Draw a neat sketch of flexible pavement section and show the component parts. Briefly explain components. **(06 Marks)**

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

c. In a dual wheel load assembly, the load on each wheel is 32kN, tyre pressure is 0.60 N/mm^2 and c/c wheel spacing is 410mm. The load is placed on a pavement 500mm thick. The sub grade is characterized by E = 20N/mm^2 and μ = 0.5. Calculate the deflections on the top of subgrade, at the radial distances of 0, 150mm and 250mm from centre of left wheel measured towards other wheel using deflection chart (chart-1). **(08 Marks)**

2 a. Explain frost action. What are the measures adopted to reduce its effects? **(06 Marks)**

b. State the assumptions and limitations of Boussinesq's theory. **(06 Marks)**

c. A plate bearing test conducted with 30cm diameter plate on subgrade yielded a pressure of 2.26 kg/cm^2 at 0.25cm deflection. Design the pavement section by Burmister's approach for a contact pressure of 8.85 kg/cm^2 having radius of contact area of 15cm (chart 2). **(08 Marks)**

3 a. Discuss briefly with the aid of sketches, the importance of wheel load and contact pressure in the design of flexible pavements. **(08 Marks)**

b. There are 2800 commercial vehicles per day on a road in both directions. The wheel load survey indicated that the wheel loads are distributed as 35kN = 25%, 45kN = 30%, 55kN = 20%, 65kN = 10%, 75kN = 10% and 85kN = 5%. Calculate the design repetitions for ten year period equivalent to 50kN wheel load using fourth power rule.

$$\left[\text{EWL factor} = \left(\frac{\text{Wheel load}}{\text{equivalent wheel load}}\right)^4\right].$$ **(12 Marks)**

4 a. Explain Mcleod method of highway pavement design. **(06 Marks)**

b. Design the flexible pavement by triaxial method using the following data:

E-value of subgrade soil	= 100 kg/cm^2
E-value of base course	= 400 kg/cm^2
E-value of 8cm thick bituminous surface	= 1000 kg/cm^2
Design wheel load	= 6000kg
Radius of contact area	= 15cm
Traffic coefficient	= 1.5
Rainfall coefficient	= 0.6
Design deflection	= 0.25cm

(06 Marks)

c. Write the equation recommended IRC:37-2001 for the computation of design traffic. Explain each term. How are the values obtained? **(08 Marks)**

PART – B

5 a. Discuss the effect of temperature on cement concrete pavement slab. Explain how warping stress occur at the critical regions of cement concrete pavement. **(10 Marks)**

b. Determine the warping stress at corner, interior and edge regions of a cement concrete pavement of thickness 200mm, contraction joint spacing of 5m and longitudinal joint spacing of 4.0m on a runway. The E value of concrete is $0.3 \times 10^5 N/mm^2$ and K value of subgrade = $0.15\ N/mm^2$. Assume the temperature differential as 17°C. Take $\alpha = 10 \times 10^{-6}/°C$, $\mu = 0.15$ (use chart 3). Assume radius of contact area of load as 150mm. **(10 Marks)**

6 a. Explain in detail with neat sketches: i) Expansion joint; ii) Contraction joint. **(10 Marks)**

b. Design the pavement slab thickness by IRC:58-2002 method, using the following data:

Modulus of subgrade reaction	$= 8 kg/cm^3$
Present traffic intensity	= 1000 CVD
Design wheel load	= 5100 kg
Radius of contact area	= 15 cm
Trial design thickness	= 25 cm
Temperature differential	= 17.6°C

Use chart 4 and chart 5. **(10 Marks)**

7 a. What is the principle involved in overlay design by Benkelman deflection studies? What steps are to be carried out in the study after marking deflection observation point? **(08 Marks)**

b. Explain any six types of flexible pavement failures. **(06 Marks)**

c. Briefly explain the various maintenance works of bituminous surfaces. **(06 Marks)**

8 a. Briefly explain the mud pumping phenomenon in concrete roads. **(06 Marks)**

b. What are the factors considered in thickness determination of airport pavement? Briefly explain LCN method of rigid airport pavement design. **(08 Marks)**

c. List the methods available for functional evaluation of pavement. Briefly explain any one method. **(06 Marks)**

Chart – 1

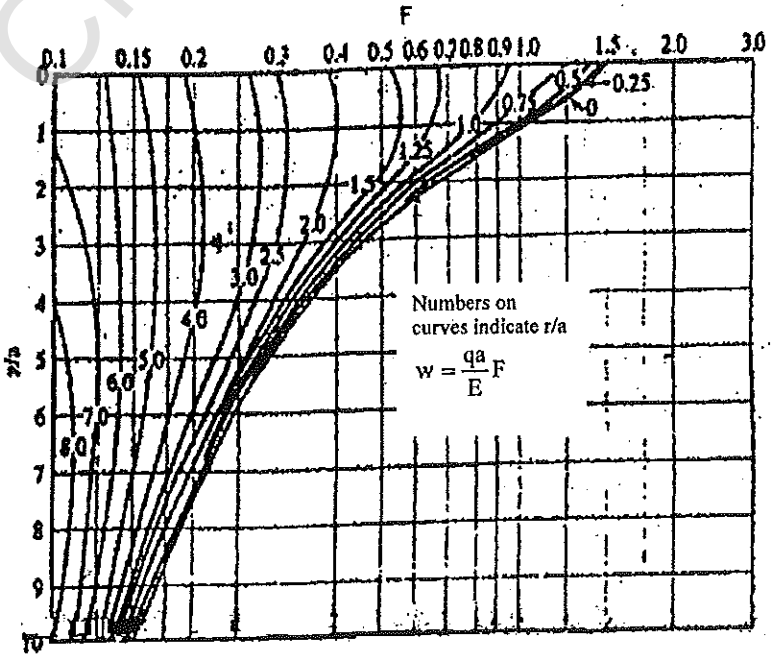

Chart – 2

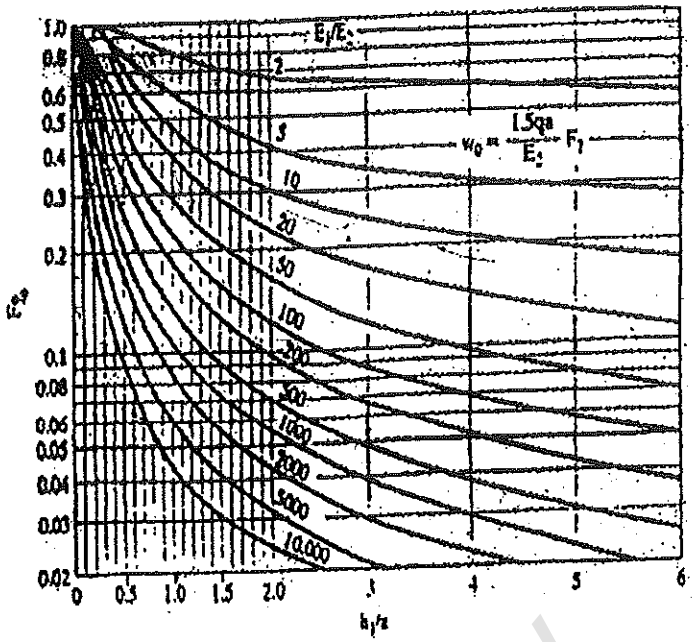

Chart – 3

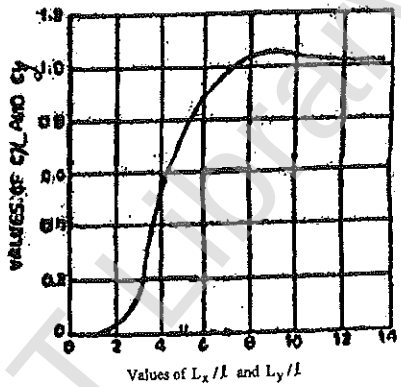

Chart – 4

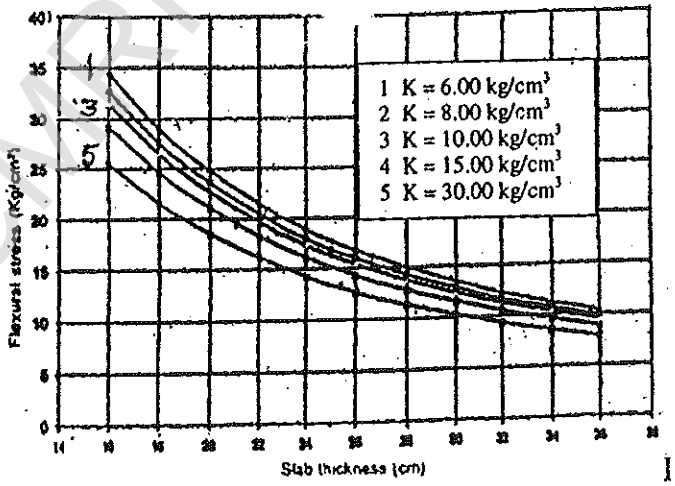

Chart – 5

L/l or B/l	C	L/l or B/l	C
1	0.000	7	1.030
2	0.040	8	1.077
3	0.175	9	1.080
4	0.044	10	1.075
5	0.720	11	1.050
6	0.920	12	1.000

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