

USN

--	--	--	--	--	--	--	--	--	--

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/mm² and c/c wheel spacing is 410mm. The load is placed on a pavement 500mm thick. The subgrade is characterized by $E = 20\text{N/mm}^2$ and $\mu = 0.5$. 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/cm² at 0.25cm deflection. Design the pavement section by Burmister's approach for a contact pressure of 8.85 kg/cm² 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

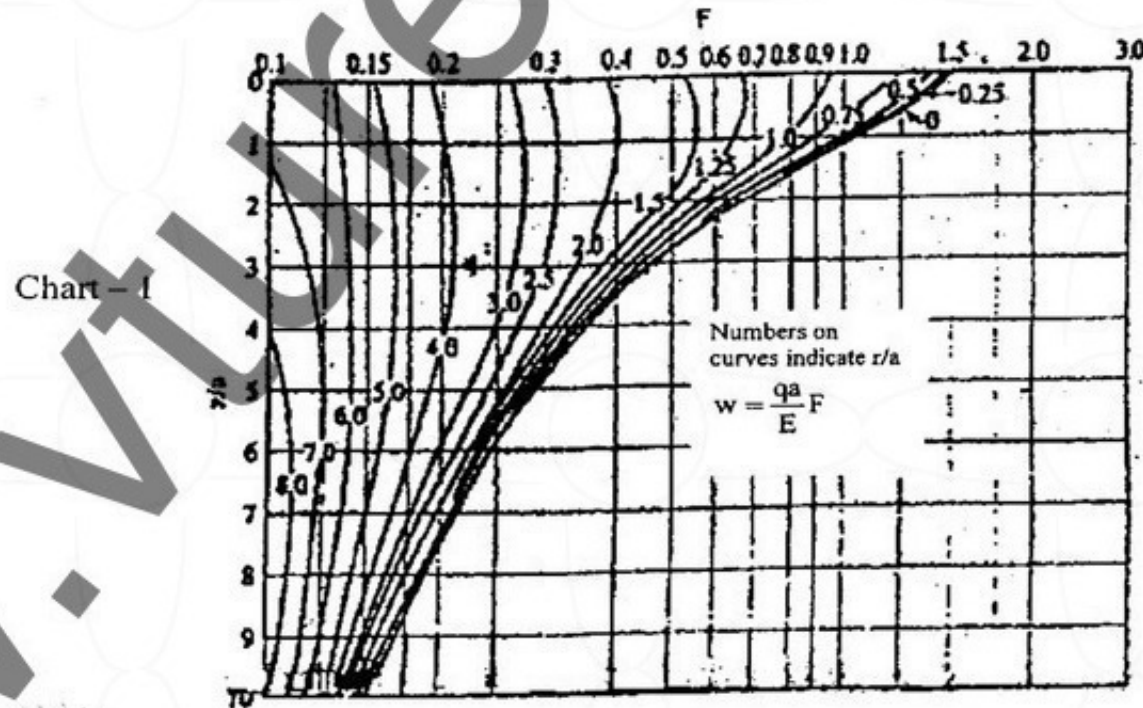
 (06 Marks)
 - c. Write the equation recommended IRC:37-2001 for the computation of design traffic. Explain each term. How are the values obtained? (08 Marks)

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.

10CV833

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 $0.3 \times 10^5 \text{ N/mm}^2$ and K value of subgrade = 0.15 N/mm^2 . Assume the temperature differential as 17°C . Take $\alpha = 10 \times 10^{-6}/^\circ\text{C}$, $\mu = 0.15$ (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)



2 of 3

10CV833

Chart - 2

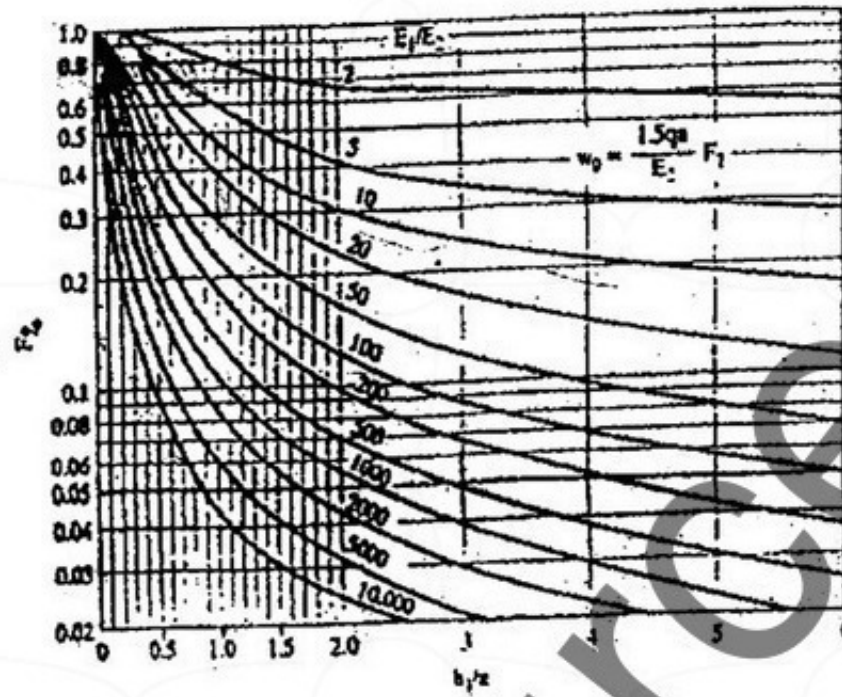


Chart - 3

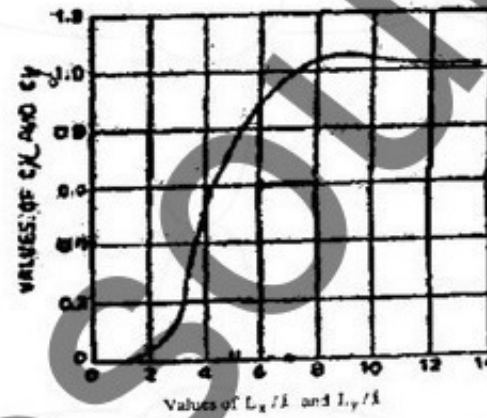


Chart - 4

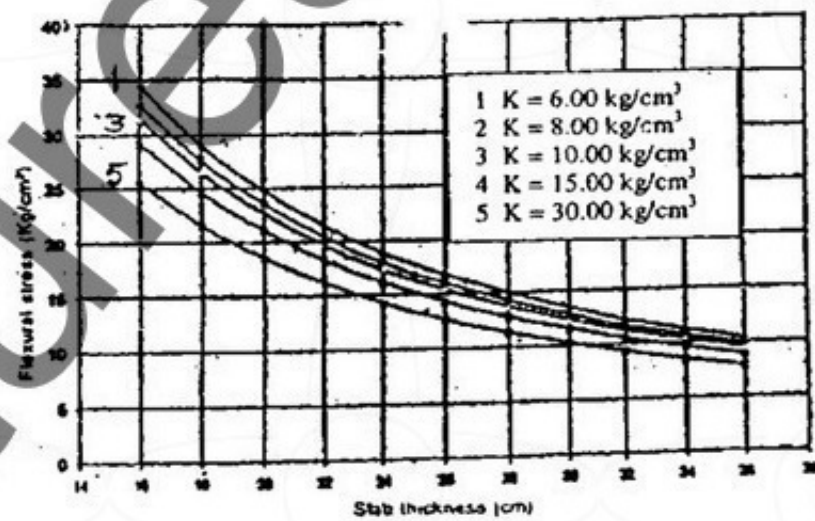


Chart - 5

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
