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10CV833

**Eighth Semester B.E. Degree Examination, June/July 2019**  
**Pavement Design**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting  
atleast TWO questions from each part.**

**PART - A**

- 1
  - a. Draw a neat sketch of flexible pavement section and show the components and their functions. (06 Marks)
  - b. Distinguish between highway and airport pavements. (06 Marks)
  - c. Mention the various factors to be considered in design of pavements. Explain any two of them. (08 Marks)
  
- 2
  - a. Explain frost action. What are the measures adopted to reduce its effects. (08 Marks)
  - b. A plate load test conducted with 0.3m diameter plate on subgrade and on a pavement of thickness 0.4m, sustained pressure of 0.1 MN/m<sup>2</sup> and 0.40MN/m<sup>2</sup> respectively at 5mm deflection. Design the pavement section for 50kN wheel load and contact pressure of 0.7MN/m<sup>2</sup> for an allowable deflection of 8mm using Burmister's approach. If you want to maintain the deflection of 6.5mm. What would be the required thinness? [Use the chart in Fig.Q2(b)]. (12 Marks)

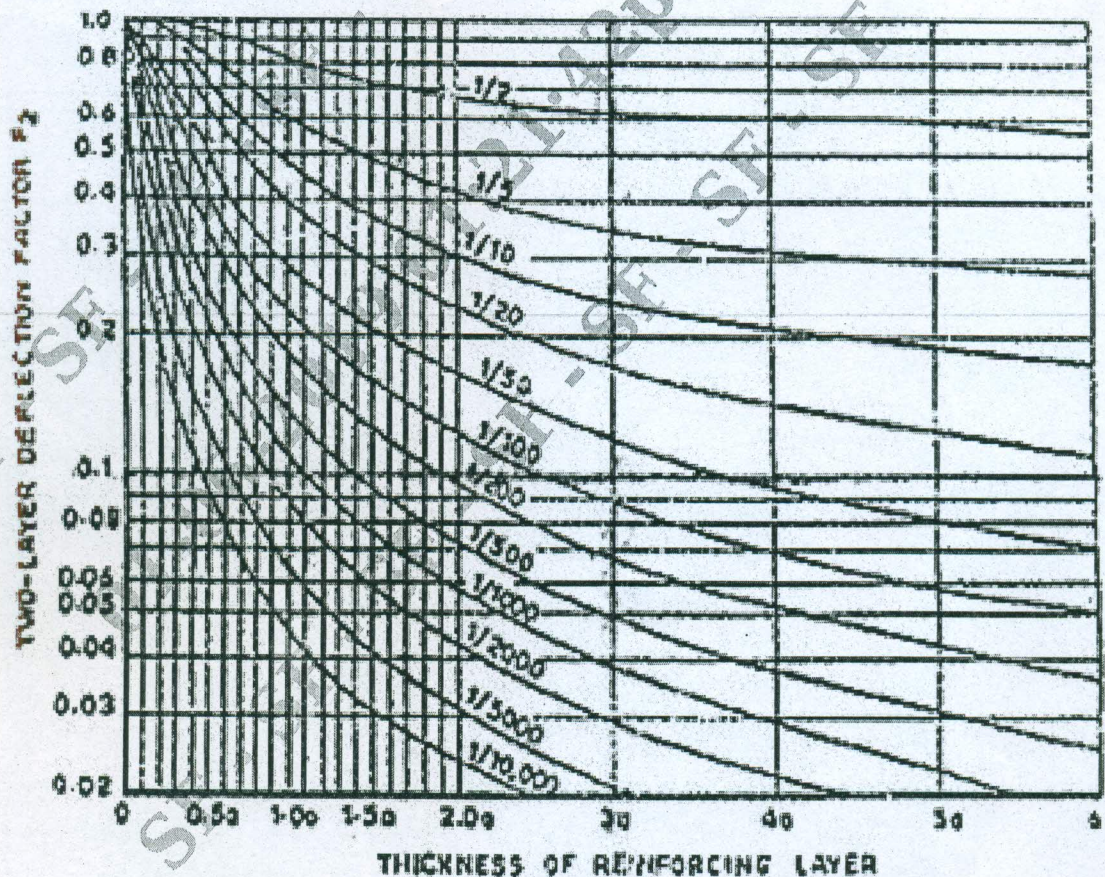


Fig.Q2(b)

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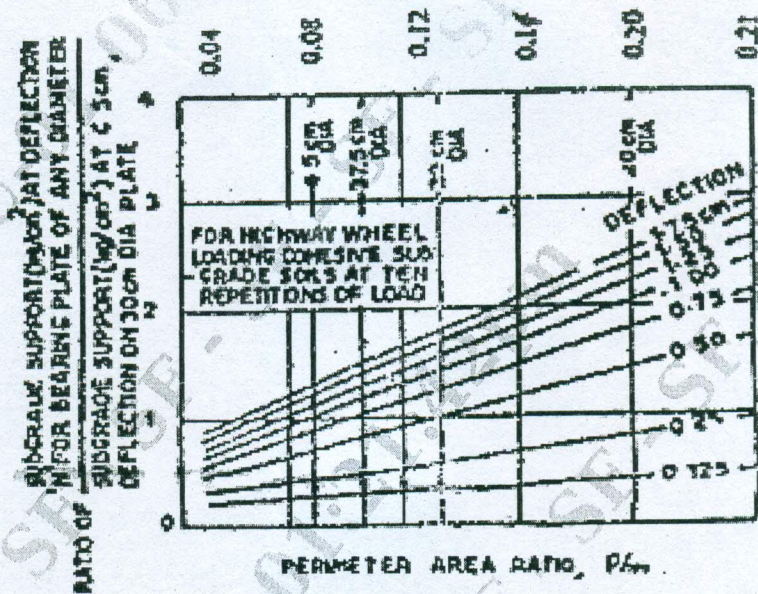
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.



- 3 a. What is ESWL? Calculate the ESWL of a dual wheel assembly carrying 2004 kg each for pavement thickness of 15, 20 and 25 cms, center to center of tyre spacing = 27cm and distance between the walls of tyres is 11 cms. Use graphical method. (08 Marks)
- b. Calculate the design repetitions for 20 years period for various wheel loads equivalent to 22.68 kN wheel load using the following data on a four lane road. (08 Marks)

Load, kN	22.68	27.22	31.75	40.82	45.36	49.90	54.43
Volume/day	30	25	20	15	10	5	1

- c. Differentiate between tyre pressure and contact pressure. (04 Marks)
- 4 a. Briefly explain the procedure of CSA method for the flexible pavement design as per IRC : 37 : 2001 (10 Marks)
- b. Design a highway pavement for a wheel load of 4100 kgs with a tyre pressure of 5 kg/cm<sup>2</sup> by Mclead method. The plate bearing tests carried out on subgrade soil using 30cm diameter plate yielded a pressure of 2.5kg/cm<sup>2</sup> after 10 repetitions of load at 0.5 cm deflection. [Use Fig.Q4(b)(i) and Fig.Q4(b)(ii)]. (10 Marks)



Relationship of Subgrade Support with P/A ratio

Fig.Q4(b)(i)

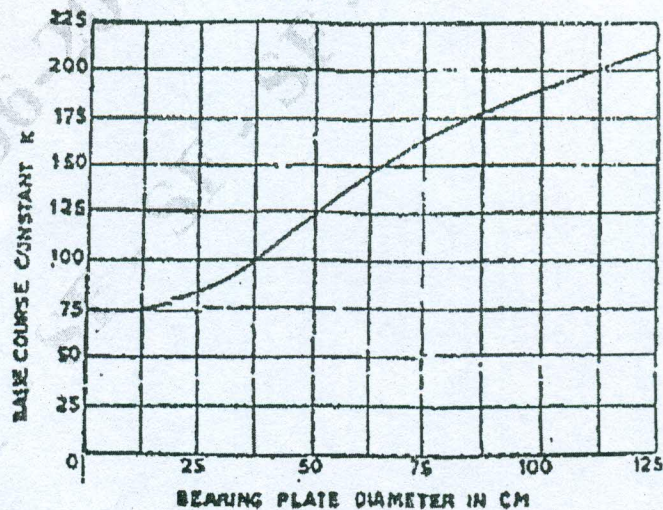


Fig.Q4(b)(ii)



- 5 a. Define the terms :
- Modulus of subgrade reaction
  - Radius of relative stiffness
  - Radius of resisting section.
- (06 Marks)
- b. Calculate the warping stresses at interior, edge and corner regions in a 25 cm thick concrete pavement with transverse joints at 11m interval and longitudinal joints at 3.6m intervals. The modulus of subgrade reaction is  $6.9 \text{ kg/cm}^3$ . Assume temperature differential for day conditions to be  $0.6^\circ\text{C}$  per cm slab thickness. Assume radius of loaded area as 15cm for computing warping stress at corner. [Use Fig.Q5(b)]. Assume  $e = 10 \times 10^{-6}$  per  $^\circ\text{C}$ ,  $E = 3 \times 10^5 \text{ kg/cm}^3$ ,  $\mu = 0.15$ .
- (14 Marks)

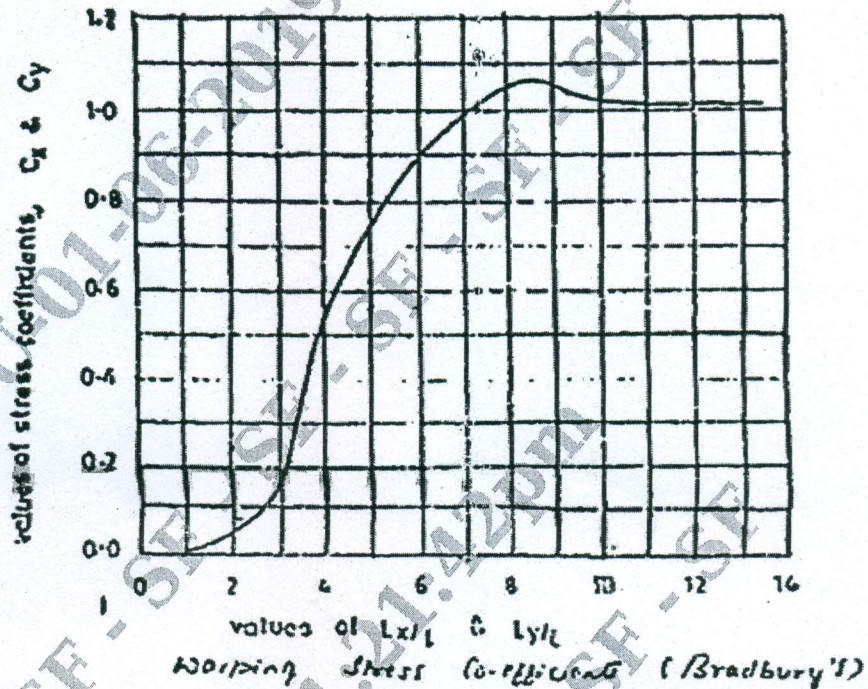


Fig.Q5(b)

- 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 25cm with radius of relative stiffness 80cm, for a design wheel load of 5000kg. Assume load capacity of the dowel system as 40% of the design wheel load. Joint width is 2cm, permissible shear and flexural stresses in dowel bar are 1000 and 1400  $\text{kg/cm}^2$  respectively and permissible bearing stress in CC is  $100 \text{ kg/cm}^2$ . (14 Marks)
- 7 a. Explain Benkelmen beam deflection method for structural evaluation of flexible pavement and subsequent determination of overlay thickness. (10 Marks)
- b. Describe the types of failures in flexible pavements. (10 Marks)
- 8 a. Explain the common type of failures in rigid pavements. (10 Marks)
- b. Write a short note on :
- Functional evaluation of pavement by visual inspection
  - Measurement of pavement unevenness. (10 Marks)

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