

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Mention and explain the various factors to be considered for design of pavements. (10 Marks)
- b. Explain the functions of different components of flexible pavement. (10 Marks)
- 2 a. Explain the various advantages and limitations of Burmister's method of pavement design over other methods. What are the assumptions made in this method. (10 Marks)
- b. The plate bearing tests were conducted with 30 cm plate diameter on subgrade soil and then over 15 cm base course. The pressure yielded at 0.5 cm deflection are  $1.25 \text{ kg/cm}^2$  and  $4.0 \text{ kg/cm}^2$  respectively. Design the pavement section for 4100 kg wheel load with tyre pressure of  $5 \text{ kg/cm}^2$  for an allowable deflection of 0.5 cm using Burmister's approach. Use Fig. 2(b). (10 Marks)

DESIGN OF HIGHWAY PAVEMENTS

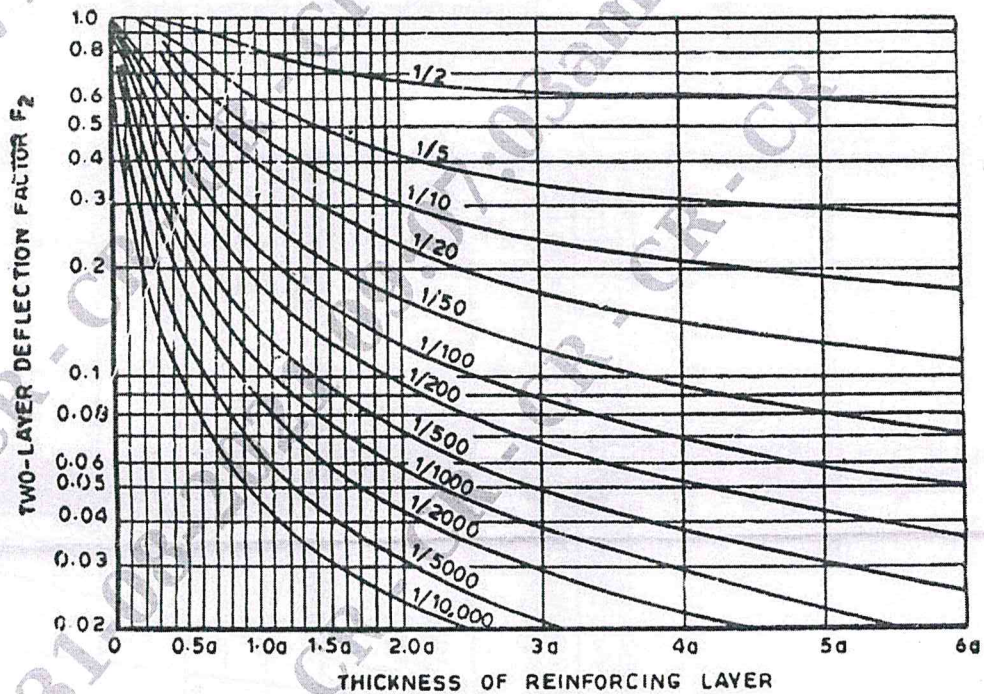
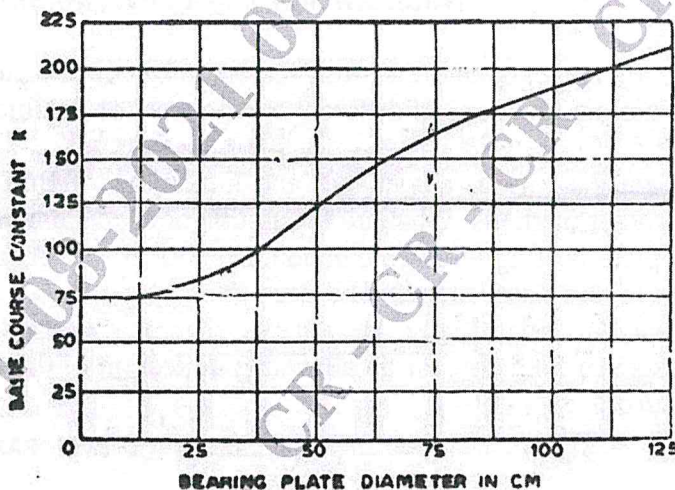
Relationship of  $F_2$  and  $h$  in a Two-lane System (Burmister's Method)

Fig. Q2 (b)

- 3 a. Define the term 'ESWL'. Explain the method of determining ESWL of a dual wheel assembly for different pavement thicknesses. (10 Marks)
- b. Explain in detail the various effects of improper drainage on flexible pavement. (10 Marks)

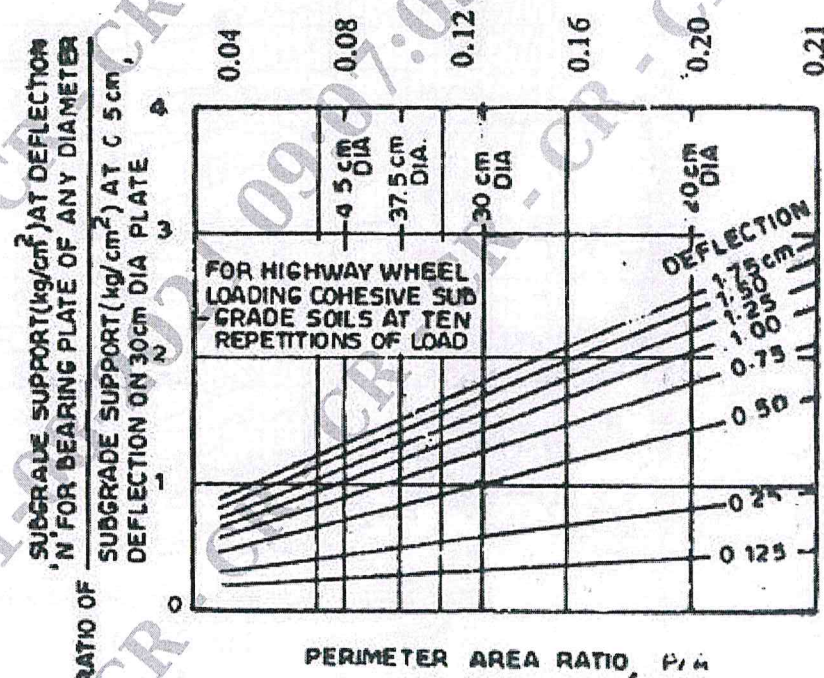
- 4 a. Compare IRC method and Tri-axial method of flexible pavement design. (10 Marks)
- b. The plate bearing test carried out on subgrade soil using 30 cm diameter plate yielded a pressure of 2.50 kg/cm<sup>2</sup> after 10 repetitions of load at 0.5 cm deflection. Design the highway pavement for a wheel load of 4100 kg and a tyre pressure of 5 kg/cm<sup>2</sup> by McLeod method. (Use Fig. Q4 (b) – (i) and Fig. Q4 (b) – (ii). (10 Marks)

DESIGN OF FLEXIBLE PAVEMENTS



Relation between Plate Diameter and Base Course Constant

Fig. Q4 (b) – (i)



Relationship of Subgrade Support with P/A ratio

Fig. Q4 (b) – (ii)

- 5 a. Explain the critical locations of loading as regards wheel load stresses in cement concrete pavements. Discuss the Westergaards concept and assumption. (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 cm interval. The modulus of subgrade reaction (K) is  $6.90 \text{ kg/cm}^2$ . Assume temperature differential for day condition to be  $0.6^\circ\text{C}$  per cm slab thickness. Assume radius of loaded area as 15 cm for computing warping stresses at the corner. Given

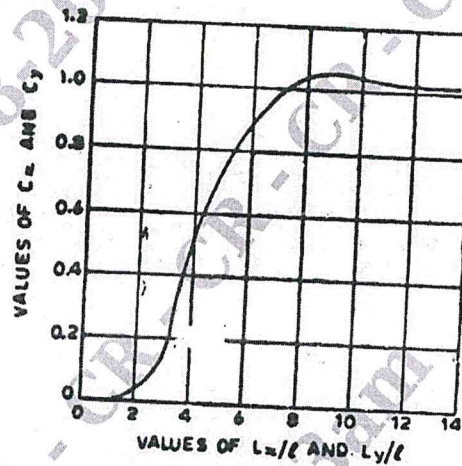
$$e = 10 \times 10^{-6} \text{ per } ^\circ\text{C}.$$

$$E = 3 \times 10^5 \text{ kg/cm}^2$$

$$\mu = 0.15$$

(10 Marks)

Use Fig. Q5 (b).



Warping Stress Coefficient

Fig. Q5 (b)

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- 6 a. Mention different types of joints in cement concrete pavements. Explain the functions of each. (10 Marks)
- b. Explain critical combination of stresses related to cement concrete pavements. (10 Marks)
- 7 a. Mention typical failures in flexible pavement. With neat sketches, explain any four of them. (10 Marks)
- b. Mention various causes of cement concrete pavement failures. Explain any four of them. (10 Marks)
- 8 Write short notes on:
- Falling weight deflectometer.
  - Functional evaluation of pavements.
  - Dowel bars.
  - Frictional stresses.

(20 Marks)

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