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**Eighth Semester B.E. Degree Examination, July/August 2022**  
**Pavement Design**

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any may be assumed.*

**Module-1**

- 1 a. What are the different layers of flexible pavements? Explain the functions of each with neat sketch. (08 Marks)
- b. Briefly explain the desirable characteristics of pavement. (08 Marks)

**OR**

- 2 a. A wheel load of 5000 kg and contact pressure 6 kg/cm<sup>2</sup> applied on top of soil mass. Find the maximum deflection at a depth of 50 cm. Also find deflection at r/a ratio = 0, 1, 2. Assume E = 50 kg/cm<sup>2</sup>. Also find vertical stress. (08 Marks)

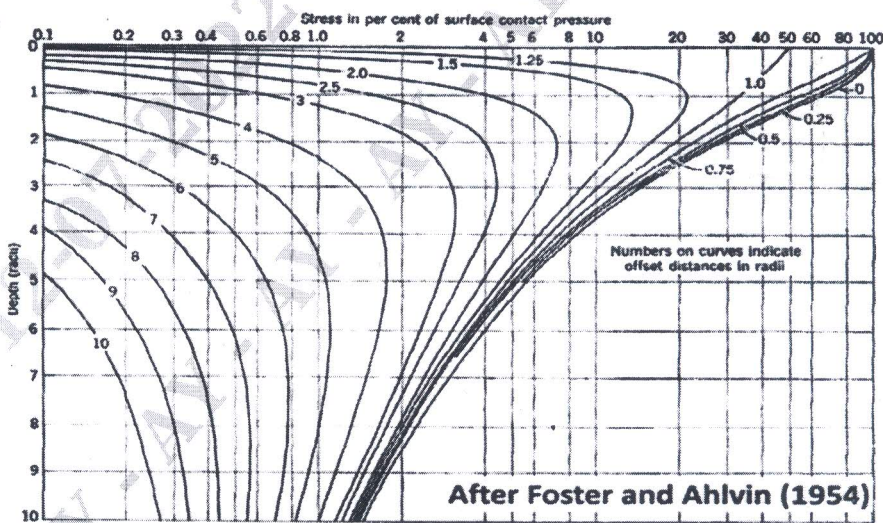
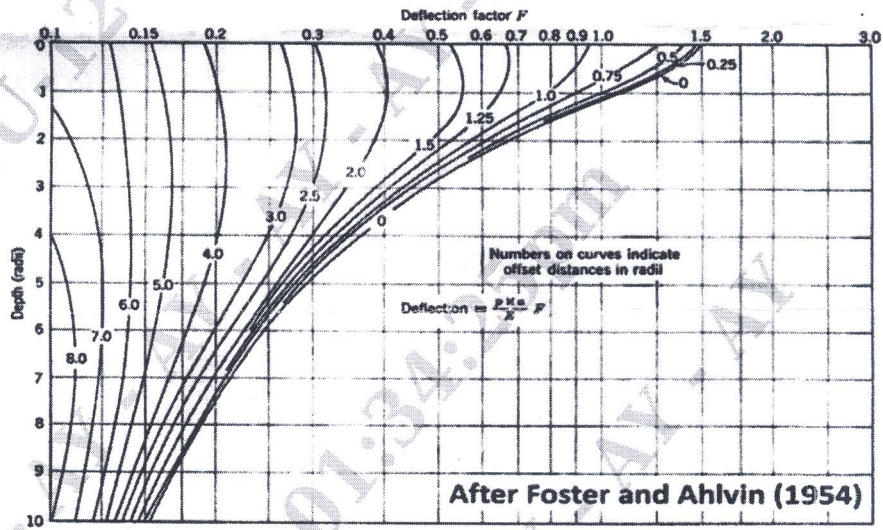


Fig. Q2(a)

- b. Explain pressure distribution bulb. List the assumptions and limitations of single layer theory. (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.

**Module-2**

- 3 a. Explain the factors that affect design and performance of highway pavements. (08 Marks)  
 b. Determine the values of ESWL for dual wheel assembly carrying 2000 kg for each wheel for pavement thickness of 12 cm, 18 cm, 24 cm, centre to centre distance between tyre is 25 cm and clear distance between tyres is 10 cm. (Use graphical method). (08 Marks)

**OR**

- 4 a. Briefly explain the procedure of CSA method for the flexible pavement, design as per IRC : 37 – 2001. (08 Marks)  
 b. Design the pavement section by triaxial stress method using the following data:  
 Wheel load = 4100 kg ; Radius of contact area = 15 cm; Traffic co-efficient = 1.5;  
 Rainfall co-efficient = 0.9 ; E value of subgrade soil = 100 kg/cm<sup>2</sup> ;  
 E value of base course = 400 kg/cm<sup>2</sup> ; E value of 7.5 cm thick bituminous concrete surface course = 1000 kg/cm<sup>2</sup> (08 Marks)

**Module-3**

- 5 a. Explain the typical flexible pavement failures with respect to their causes. (08 Marks)  
 b. Write short notes on : (i) Functional evaluation by visual inspection (08 Marks)  
 (ii) Unevenness measurement.

**OR**

- 6 a. Discuss the structural evaluation by Benkelman beam deflection method. (08 Marks)  
 b. Write short notes on : (i) FWD (ii) GPR (08 Marks)

**Module-4**

- 7 a. Explain the following :  
 (i) Modulus of subgrade reaction.  
 (ii) Radius of relative stiffness.  
 (iii) Radius of resisting section.  
 (iv) Stresses in rigid pavement. (08 Marks)  
 b. Using the data given below, calculate the wheel load stress at interior, edge and corner regions of cement concrete pavement using Westergaard's equations. Also determine the probable location where the crack is likely to develop due to corner loading.  
 Wheel load = 5100 kg Modulus of elasticity of CC =  $3 \times 10^5$  kg/cm<sup>2</sup>  
 Pavement thickness = 18 cm Poisson's ratio = 0.15  
 Modulus of subgrade reaction = 6 kg/cm<sup>3</sup> (08 Marks)

**OR**

- 8 a. Briefly explain the procedure of design of rigid pavement as per IRC : 58-2002. (08 Marks)  
 b. Design size and spacing of dowel bars at an expansion joint of concrete pavement of thickness 25 cm, radius of relative stiffness is 80 cm, design wheel load 5000 kg, load capacity of the dowel system is 40% of design wheel load. Joint width 2.0 cm and the permissible stress in shear, bending and bearing stress in dowel bars are 1000, 1400 and 100 kg/cm<sup>2</sup> respectively. (08 Marks)

**Module-5**

- 9 a. Explain various types of rigid pavement failures with neat sketches. (08 Marks)  
 b. Explain briefly the pavement evaluation. (08 Marks)

**OR**

- 10 a. Write short notes on : (i) Types of joints in CC pavement (ii) Maintenance of joints. (08 Marks)  
 b. The maximum increase in temperature is expected to be 26°C after construction of CC pavement. If the expansion joint gap 22 mm. Design the spacing between expansion and plain construction joint. Assume all suitable data. (08 Marks)