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Eighth Semester B.E. Degree Examination, June/July 2016

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. Describe the desirable properties of pavements. (06 Marks)
 - b. Explain the strategies adopted in pavement design. (06 Marks)
 - c. Bring out the characteristic differences between flexible and rigid pavements. (08 Marks)

- 2
 - a. Explain frost action. What are the remedial measures? (06 Marks)
 - b. List the assumptions and limitations of Boussinesquis Theory. (06 Marks)
 - c. A dual wheel load assembly with 70 kN load on each wheel and contact pressure of 0.7 N/mm^2 is applied on a homogeneous mass with modulus of elasticity 12 N/mm^2 . If the centre to centre distance between the two wheels is 600 mm, determine the deflection value at a depth of 0.5 m at four points, at the centre of dual wheels, and at radial distances of 300, 600 and 900 mm from this centre along the line joining centers of the two wheel loads. Use deflection factor chart Fig. Q2(c). (08 Marks)

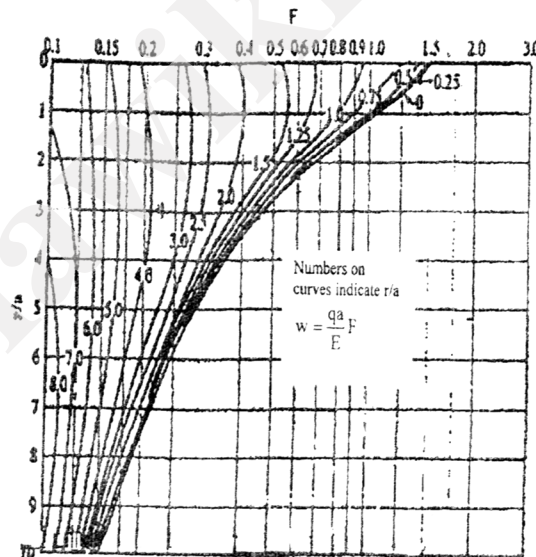


Fig. Q2(c)

- 3
 - a. With a sketch, describe the significance of design wheel load and contact pressure in design of pavement. (06 Marks)
 - b. Describe the procedure of calculating ESWC by equal deflection criteria. (06 Marks)
 - c. Calculate design repetitions for 20 years period for various wheel loads equivalent to 22.68 kN wheel load, using the following traffic survey data on a four lane road. (08 Marks)

Wheel load, kN	Average daily traffic (both) directions	% of total traffic volume
22.68	Total volume considering traffic growth = 215	13.17
27.22		15.30
31.75		11.36
36.29		14.11
40.82		6.21
45.36		5.84

- 4 a. Explain with examples, how are the flexible pavement design methods classified. (06 Marks)
- b. Design a highway pavement using Mcleod's method for a wheel load of 57 kN (5100 kg) and tyre pressure 0.63 N/mm^2 (6.3 kg/cm^2). The subgrade support from repeated plate load test using 300 mm (30 cm) diameter plate was 14.30 kN (1430 kg) at 5 mm (0.5cm) deflection. Assume base course constant as 90. (06 Marks)
- c. Design the pavement by triaxial method using the following data :
- | | | |
|--|----------|-------------------------------------|
| Wheel load | = 51 kN | |
| Radius of contact area | = 150 mm | |
| Traffic coefficient | = 1.5 | |
| Rainfall coefficient | = 0.9 | |
| Design deflection | = 2.5 mm | |
| E – value of subgrade soil | | = 10 N/mm^2 |
| E – value of base course material | | = 40 N/mm^2 |
| E – value of 75 mm thick bituminous concrete surface | | = 100 N/mm^2 . (08 Marks) |

PART – B

- 5 a. What is warping stress? With a sketch explain how warping stresses are developed in CC pavements. (06 Marks)
- b. Write a note on :
- Critical load positions
 - Critical combination of stresses. (06 Marks)
- c. A CC pavement, 200 mm thick, has longitudinal joints at 3.5 m and transverse joints at 4.5 m spacing. The modulus of subgrade reaction is 0.1 N/mm^3 and modulus of elasticity of CC is $3 \times 10^4 \text{ N/mm}^2$. Find the wheel load stresses at edge and corner regions of the slab due to wheel load of 51 kN with radius of contact area 150 mm. (08 Marks)
- 6 a. The maximum increase in temperature is expected to be 26°C after the constructions of a CC pavement. If the expansion joint gap is 22 mm, design the spacing between expansion and plain contraction joints. Assume all other data suitable. (06 Marks)
- b. A CC pavement 200 mm thick and 7.5 m wide has a longitudinal joint along the centre line. Design the diameter length and spacing of tie bars if permissible stream in steel is 140 N/mm^2 and coefficient of friction is 1.2. Assume unit weight of concrete as 24000 N/m^3 . (06 Marks)
- c. Describe the step by step procedure in design of dowel bars. Indicate the equation used. (08 Marks)
- 7 a. Explain the typical flexible pavement failures with respect to their causes. (10 Marks)
- b. Explain the step by step procedure of conducting Benkelman beam deflection studies in the field on a stretch of flexible pavement for providing flexible overlay. What are the necessary corrections to be applied? (10 Marks)
- 8 a. Explain the following with respect to rigid pavement :
- Scaling of cement concrete
 - Spalling of joints
 - Mud pumping. (10 Marks)
- b. Explain the following in rigid pavements :
- Treatment of cracks
 - Maintenance of joints. (10 Marks)

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