

CBCS SCHEME

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15CV833

Eighth Semester B.E. Degree Examination, November 2020 Pavement Design

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions irrespective of modules.
2. Use of IRC charts is permitted.*

Module-1

- 1 a. Describe the characteristics of a pavement for efficient performance structurally and functionally. (08 Marks)
b. What are the major differences between Flexible and Rigid pavements? (08 Marks)
- 2 a. Determine the thickness of pavement by single layer elastic theory so as to limit deflection of subgrade to 5mm due to
(i) Wheel load of 50 kN and contact pressure of 0.7 N/mm² due to truck loading.
(ii) Wheel load of 5 kN and a contact pressure of 5 kN/mm² due to bullock cart loading. (08 Marks)
b. A plate bearing test was conducted with 30 cms plate dia on soil subgrade and on 15cm base curve. The pressure yielded at 0.5 cm deflection are 1.25 kg/cm² and 4 kg/cm². Design a pavement section of 5 kg/cm² for allowable deflection of 0.5cm using Burmister's approach. (08 Marks)

Module-2

- 3 a. What are the major factors affecting the pavement design? Explain briefly. (08 Marks)
b. Calculate the design repetition for 20 years period for various wheel loads equivalent to 2268 kg wheel load using the following data on a 4 lane road. The average daily traffic in both the way 215.

Wheel load kg	2268	2722	3175	3629	4082	4596
% of total traffic volumes	13.17	15.30	11.76	14.11	6.21	5.84

(08 Marks)

- 4 a. It is proposed to widen an existing 4 lane NH section to 3 lane dual carriage way road. Design the pavement for new carriageway for the following data:
Initial traffic for both directions is 4900 CVPD. Expected growth rate 8%.
Design CBR =7%, VDF = 4.5, Design life = 15 years. (08 Marks)
b. Design the pavement by KANSAS Triaxial method given.
E of subgrade = 90 kg/cm²; E of paving material = 900 kg/cm²; Wheel load = 5100 kg;
Tyre pressure = 7 kg/cm²; x = 1.5 cm, y = 0.8 cm. Calculate the thickness of pavement layers of base course and sub-base course to be provided wing having an E value of 400 and 200 kg/cm² respectively. (08 Marks)

Module-3

- 5 a. What are the major structural and functional failures in flexible pavements? Explain each of them briefly. (10 Marks)
b. Explain briefly the procedure of functional evaluation (Roughness) of flexible pavement using Bump-Integrator. (06 Marks)

- 6 a. Explain the brief procedure for structural evaluation of a flexible pavement by Benkelman Beam Deflection Studies with a neat sketch of components. (10 Marks)
- b. Explain the major factors affecting the design of a runway at Airports. (06 Marks)

Module-4

- 7 a. What are the various types of stresses acting on a rigid pavement? Briefly explain the concept of 'warping' of cement concrete slab with a neat sketch. (08 Marks)
- b. A concrete slab 7.5m long, 3.5m wide and 200mm thick is subjected to a temperature differential of 12°C. Assume 'K' as 54 MN/m³, $\alpha = 10 \times 10^{-6}/^{\circ}\text{C}$. Determine the warping stress at interior, edge and corner region of slab. Take $E = 30 \text{ GPa}$, $\mu = 0.15$, Radius of loaded area = 150 mm. (08 Marks)
- 8 a. What are the major factors affecting the design of a cement concrete pavement? Explain briefly. (06 Marks)
- b. Design a dowel bar system for a cement concrete slab for the following conditions:
Design wheel = 4100 kg ; Design load transfer = 40% ; Slab thickness $h = 20 \text{ cm}$;
Joint width = 2 cm ; Permissible flexural stress in dowel bar = 1400 kg/cm² ;
Permissible shear stress = 1000 kg/cm² ; Permissible bearing stress in concrete = 100 kg/cm²
K value of subgrade = 8 kg/cm³ ; $E = 3 \times 10^5 \text{ kg/cm}^2$; $\mu = 0.15$ (10 Marks)

Module-5

- 9 a. What are the various types of failure in the Rigid pavement? Explain them briefly. (10 Marks)
- b. Describe the major characteristics of Joints in cement concrete pavement. State the need for joints. (06 Marks)
- 10 a. Explain briefly the various remedial measures that can be adopted in maintenance of rigid pavement. (06 Marks)
- b. What are the various types of joints in CC pavements? Explain them briefly with neat sketches. (10 Marks)

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