

CBCS SCHEME

USN

1 A Y 2 0 M T 4 1 5

18CV825

Eighth Semester B.E. Degree Examination, June/July 2023

Pavement Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. List and explain the desirable factors to be considered for the design of pavement. (12 Marks)
b. Bring out the points of difference between flexible and rigid pavements. (08 Marks)

OR

- 2 a. Draw a neat sketch of flexible pavement c/s and show the component parts. Enumerate the functions of each component of its pavement. (12 Marks)
b. Bring out the difference between highway and airport pavement. (08 Marks)

Module-2

- 3 a. With a neat sketch, explain the ESWL concept of dual wheel assembly. (08 Marks)
b. Calculate the design repetitions for 15 years period equivalent to 2268 kg wheel load, if the mixed traffic in both directions is 1974 veh/day. The details of distribution of different wheel load of commercial vehicles are given below:

Wheel load in kg	% in total traffic volume
2268	25
2722	12
3175	09
3629	06
4082	04
4536	02
4990	01

(12 Marks)

OR

- 4 a. Write a note on CBR method of pavement design by cumulative standard axle load. (10 Marks)

- b. Design the pavement section by triaxial test method using the following data:

Wheel load = 4100 kg

Radius of contact area = 15 cm

Traffic coefficient = 1.5

Rainfall coefficient = 0.9

Design deflection $\Delta = 0.25$ cm

$E_s = 100$ kg/cm², $E_b = 400$ kg/cm²

E - value of 7.5 cm thick bituminous concrete = 100 kg/cm²

(10 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-3

- 5 a. List the general causes of pavement failures. (06 Marks)
- b. Benkelman beam deflection studies were carried out on 15 selected points on a stretch of flexible pavement during summer season using a dual wheel load of 4085 kg, 5.6 kg/cm² pressure. The deflection values obtained in mm after making the necessary lag corrections are given below. If the present traffic consists of 750 CVPD, determine the thickness of bituminous overlay required, if the pavement temperature during the test was 30°C and the correction factor for subsequent increase in subgrade moisture content is 1.3. Assume annual rate of growth of traffic as 7.5%. Adopt IRC guidance 1.40, 1.32, 1.25, 1.35, 1.48, 1.60, 1.65, 1.55, 1.45, 1.40, 1.36, 1.46, 1.50, 1.52, 1.45 mm. (14 Marks)

OR

- 6 With a neat sketch, explain the following failures of flexible pavement:
- Alligator cracking
 - Consolidation of pavement layers
 - Shear failure
 - Frost heaving
 - Lack of binding with lower layer
- (20 Marks)

Module-4

- 7 a. Write a note on Westergaard's concept for temperature stress. (08 Marks)
- b. Determine the warping stress at interior, edge and corner regions in a 25 cm thick concrete pavement with transverse joints at 11 m interval and longitudinal joints at 3.6 m. $K = 6.9 \text{ kg/cm}^3$, $t = 0.6^\circ\text{C}$ per cm slab thickness, $a = 15 \text{ cm}$, $e = 10 \times 10^{-6}$ per $^\circ\text{C}$, $\mu = 0.15$, $E = 3 \times 10^5 \text{ kg/cm}^2$. (12 Marks)

OR

- 8 a. Design the size and spacing of dowel bars at the expansion joints of a CC pavement of thickness 25 cm with radius of relative stiffness 80 cm, $P = 5000 \text{ kg}$. Assume load capacity of the dowel bar system as 40% of the design wheel load. Joint width is 2 cm. $F_s = 1000 \text{ kg/cm}^2$, $F_f = 1400 \text{ kg/cm}^2$ and $F_b = 100 \text{ kg/cm}^2$. (14 Marks)
- b. Write note on:
- Westergaard's modulus of subgrade reaction
 - Relative stiffness of slab to subgrade
 - Equivalent radius of resisting section
- (06 Marks)

Module-5

- 9 a. With a neat sketch, explain the location of joints. Enumerate the functions of each joints in CC pavements. (12 Marks)
- b. The width of expansion joint gap is 2.5 cm in a CC pavement. If the laying temperature is 10°C and the maximum slab temperature in summer is 54°C. Calculate the spacing between expansion joints. $e = 10 \times 10^{-6}$ per $^\circ\text{C}$. (08 Marks)

OR

- 10 a. With a neat sketch, explain the failures of rigid pavements of mud pumping. (12 Marks)
- b. List and explain the properties of concrete. (08 Marks)
