

B.E. Civil Engineering (Model Curriculum) Semester - VI  
**PEC-CE601 - Pavement Design**

P. Pages : 3

Time : Three Hours



**GUG/S/23/13730**

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Discuss in details difference between flexible pavement and Rigid pavement. 8
- b) Estimate ESWL for dual wheel assembly having total load of 15000 kg at 9.5kg/cm<sup>2</sup> type pressure clear spacing of duals is 20 cm. Assume pavement thickness = 55 cm, 75cm and 100cm. 8

**OR**

2. The axle load distribution of commercial vehicles on a highway is as under. 16

Axle load Group (kg)	Distribution	ADT
<1000	08	140
1000-3000	20	350
3000-5000	14	245
5000-7000	15	262.5
7000-9000	13	227.5
9000-11000	12	210
11000-13000	10.5	183.75
13000-15000	7.5	131.25

Calculate the standard axles to be used in design for strengthening the pavement. When the current traffic on a two lane road is 1750 CVD. The rate of growth is 7% per annum and period of construction is 2 years. The design life is 20 years after construction assume the legal axle load as 8000 kg.

3. a) Explain CBR test and its limitations. 8
- b) A plate load test with 30 cm dia plate conducted on subgrade gave the following data. 8

Settlement (mm)	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0
Load on Plate (kg)	0	630	1250	1910	2352	2785	3505	4070	4610

**OR**

4. a) Explain in brief Marshall's method of bituminous mix design. 8
- b) Estimate group index of subgrade soil from following data. 8

Passing 425 $\mu$  – 82%

Passing 75 $\mu$  – 65%

Liquid limit – 53%

Plastic limit – 28%

Classify the soil by AASHO system and discuss its suitability of subgrade.

5. a) Calculate cone bearing value from following data and hence design the pavement thickness from following data. 8

Load (kg)	Penetration (mm)	Half cone angle
4.5	26	7° 45'
9.0	37.8	
18.0	54.5	
36.0	79.8	

- b) Draw layout of different joints in CC pavement and explain functioning of tie bars 8

**OR**

6. Design a rigid pavement for a two lane highway from data given below. 16

- 1) Wheel load = 5200 kg
- 2) Tyre pressure = 5.5 kg/cm<sup>2</sup>
- 3) Grade of concrete = M30
- 4) Modulus of subgrade reaction = 7.5 kg/cm<sup>2</sup>/cm
- 5) C<sub>x</sub> = 0.9, C<sub>y</sub> = 0.7
- 6) Temperature gradient = 0.55° C/cm.
- 7) Projected traffic volume = 3000 CVD.

7. a) Explain PCA method of rigid pavement. 8

- b) Explain FAA method of flexible Air pavement design. 8

**OR**

8. a) From yield line theory, what maximum Aircraft gear load a rigid pavement of 350 mm thickness can carry at critical area of tyre contact radius of 220mm? Grade of concrete is M30 and 'K' of subgrade soil is 7.8 kg/cm<sup>2</sup>/cm. Assume any other data if required. 8

- b) Explain the Mcleod method of design of Airfields. 8

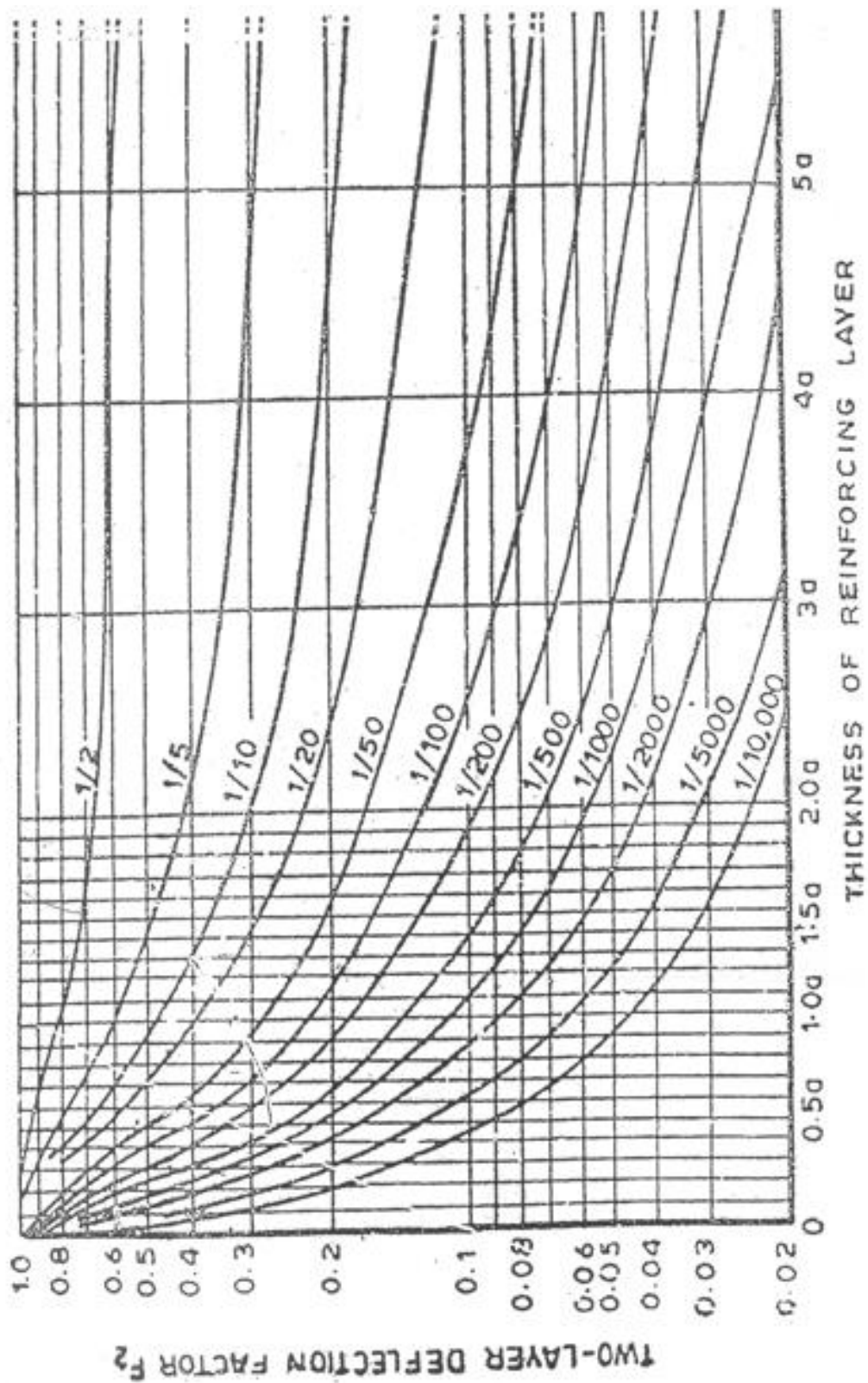
9. a) Write note on 'Repairs' and 'Maintenance' of flexible pavement. 8

- b) Write note on 'Profilometers'. 8

**OR**

10. a) Following observations are recorded in Benkelman beam deflection investigation for a certain section of state highway  
1.56, 1.46, 1.32, 14.0, 1.62, 1.55, 1.48, 1.10, 1.32, 1.48, 1.56, (corrected values in mm)  
Design a high quality bituminous overlay if maximum allowable deflection is 0.80 mm. Assume suitable layer equivalency factor. 10

- b) What are the various types of failures in Rigid pavement. 6



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

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