

B.E. Civil Engineering (CBCS Pattern) Semester - VIII
CE803 - Elective-III : Pavement Design

P. Pages : 3

Time : Three Hours



GUG/S/23/13589

Max. Marks : 80

- Notes :
1. All questions carry equal marks and compulsory.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.
 4. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1. a) Compare Highways with Airways. 6
- b) What is ESWL? Estimate ESWL for dual in Jordan wheel assembly for an aircraft for the following given data. 10

Gear Load	32,000 kg
Tyre pressure	9.5 kg/cm ²
Dual spacing	350mm (clear)
Jordan spacing	50mm (clear)
Crust thickness	600,750 and 850mm

OR

2. a) Compare rigid pavement with flexible pavement. 8
- b) From a traffic volume data for Highway, Compute total fatigue in terms of standard axle is 18 yrs period. Assume traffic growth rate of 7.5% per annum and delay to opening of traffic as 2 years. 8

Axle load	ADT	Eq. Factors
1100	95	0.002
2100	131	0.003
4100	56	0.025
6100	121	0.33
8100	147	1.00
10,000	27	1.70
14,000	22	4.25

3. a) Explain with a neat sketch North Dakota Cone test and discuss its utility. 8
- b) Explain briefly the steps in Marshall's method of Bituminous mix design. 8

OR

4. a) Estimate the group index of subgrade soil from the following data and discuss the rating as subgrade. 8
- | | |
|-----------------------|------|
| i) Passing 425M Sieve | =75% |
| ii) Passing 75M Sieve | =62% |
| iii) Liquid limit | =51% |
| iv) Plastic limit | =39% |

- b) Explain in detail stress analysis of multilayered flexible pavement. 8

5. Design a flexible pavement for a design traffic volume of 5100CVD, if permissible deflections is 5mm by Triaxial method. 16

Data

- | | |
|-----------------------------|--------------------------|
| i) Wheel load | = 4500 kg |
| ii) Tyre pressure | = 6.1 kg/cm^2 |
| iii) Traffic Coefficient | = 8/6 |
| iv) Rainfall coefficient | = 0.9 |
| v) Modulus of elasticity of | |
| i) Subgrade | = 80 kg/cm^2 |
| ii) Subbase | = 415 kg/cm^2 |
| iii) Base | = 1950 kg/cm^2 |
| iv) Bituminous surfacing | = 4400 kg/cm^2 |

OR

6. Design a rigid pavement for two lane highway from following data- 16
- | | |
|--|---|
| i) Wheel load | =5100kg |
| ii) Tyre pressure | = 6.1 kg/cm^2 |
| iii) Modulus of subgrade reaction | = $7.5 \text{ kg/cm}^2/\text{cm}$ |
| iv) Grade of concrete | = M_{30} |
| v) Temperature gradient | = 0.5°C/cm |
| vi) $C_x = 0.91$, $C_y = 0.68$ | |
| vii) Projected traffic volume | = 3200CVD |
| viii) Coefficient of thermal expansion of concrete | = $10 \times 10^{-6} \text{ per } ^\circ\text{C}$ |
| ix) Poisson's ratio of concrete | = 0.15 |

7. a) Explain PCA method of designing a rigid pavements. 8

- b) From the ultimate load analysis, find out the load factor at all the regions of pavement and also locate the failure position and draw the sketch of yield line pattern from the following data. **8**
- i) Thickness of pavement = 22cm
 - ii) Modulus of rupture (R) = 42 kg/cm²
 - iii) Modulus of subgrade reactions = 7.5 kg/cm²/cm
 - iv) Modulus of elasticity of concrete = 3.1×10⁵ kg/cm²
 - v) Wheel load = 6200kg
 - vi) Tyre pressure = 6.0 kg/cm²
 - vii) Poisson's ratio of concrete = 0.15

OR

- 8.** a) Explain in detail LCN method of designing a rigid pavement for Airfield. **8**
- b) Explain Mcload method of design of airfields. **8**
- 9.** a) Write a note on "overlays and its types". **6**
- b) What are various types of failure in flexible & Rigid pavements. **10**

OR

- 10.** a) Write a note on- **8**
- i) Profilometer
 - ii) Present serviceability Index
- b) Write a note on "Highway Maintenance". **8**
