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

P. Pages : 2

Time : Three Hours

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Max. Marks : 80

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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) Explain 'Flexible and rigid' pavements and bring out the points of difference. **8**

b) Estimate ESWL for due wheel assembly having total load of 5100 kg at $5.6 \, kg/cm^2$ tyre pressure clear spacing of rubble is 12 cm.
Assume pavement thickness 55 cm & 95 cm. **8**

OR

2. a) What are the various factors to be considered in pavement design? Discuss the significance of each. **8**

b) Estimate total fatigue in a service life of 15 years in terms of standard axle load of 8100 kg average. Assume traffic growth rate of 7.5% per annum and delay in opening to traffic as 2 years. **8**

Axle load	ADT	EQ. Factors
1100	132	0.002
2100	92	0.003
4100	102	0.025
6100	138	0.33
8100	176	1.00
10,100	82	1.70
12,100	56	4.25

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

Load	Penetration (mm)	Half angle of cone
4.5	15.2	
9.0	31.7	7º45'
18.0	51.3	
36.0	68.3	

b) Write a short note on Marshall method of mix design. **8**

OR

4. a) Estimate the group index of sub-grade soil from following data. **8**
Passing 425 micron = 90%
Passing 75 micron = 70%
Liquid limit = 45%
Plastic limit = 20%.
Also discuss its significance in classification of subgrade material.

1

	b)	Explain CBR test with its advantages & limitations.	**8**
5.	a)	A plate load test was conducted with 30 cm diameter plate on a subgrade which records 5 mm deflection with a tyre pressure of $3.6 \text{kg}/\text{cm}^2$. The test when conducted on 20 cm thick base course constructed over the subgrade with tyre pressure of $6.8 \text{kg}/\text{cm}^2$ undergoes some deflection. Find out deflection of pavement system for a wheel load of 5200 kg with tyre pressure of $6.5 \text{kg}/\text{cm}^2$ with 30 cm thick base course $\mu_s = 0.35$.	**12**
	b)	Discuss the application of Burmister's two layer theory in pavement design.	**4**

OR

6.	a)	Explain the effect due to expansion and contraction of cement concrete pavement. Discuss the type of stresses induce.	**8**
	b)	Find the radius of relative stiffness and radius of section for a concrete pavement from following data: Modulus of elasticity of concrete = $3.1 \times 10^5 \text{kg}/\text{cm}^2$ Poisson's ratio of concrete = 0.15 Modulus of subgrade reaction = $6.0 \text{kg}/\text{cm}^2$ Thickness of concrete slab = 22 cm Radius of loaded area = 16 cm	**8**
7.	a)	Explain LCN system of rigid pavement design.	**8**
	b)	Explain FAA method of flexible airfield pavement design.	**8**

OR

8.	a)	Explain PCA method of rigid pavements.	**8**
	b)	From the yield line theory what is the maximum aircraft gear load a rigid pavement of 350 mm thickness can carry at critical areas of tyre Contact radius of 220 mm. Grade of concrete M30 K of subgrade soil is $7.8 \text{kg}/\text{cm}^3$. Assume any other data if required and clearly mention the same.	**8**
9.	a)	With a neat sketch explain Benkelman beam deflection method.	**6**
	b)	What are the general causes of pavement failure?	**5**
	c)	Write a short note on profilometers.	**5**

OR

10.	a)	Explain the term overlays for flexible & rigid pavements.	**8**
	b)	Discuss briefly importance of highway maintenance.	**8**

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