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10CV833

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022
Pavement Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

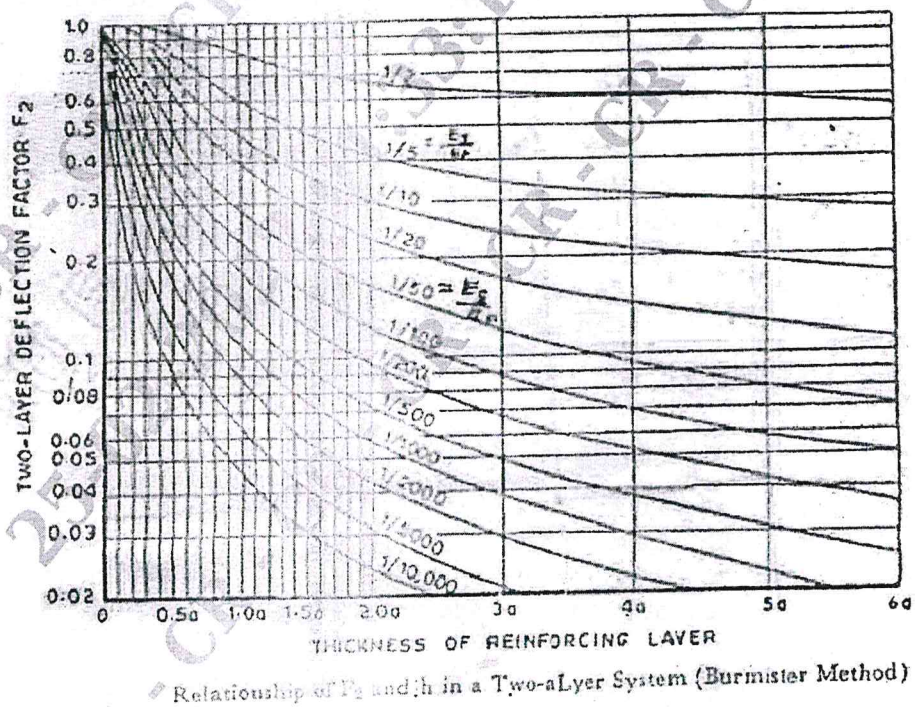
1 a. With a neat sketch of cross section of flexible type pavement, explain the various component and briefly bring out their functions. **(10 Marks)**

b. Bring out the differences between highway pavements and airfield pavements. **(05 Marks)**

c. Explain the difference between rigid and flexible pavements. **(05 Marks)**

2 a. Explain any three factors that affect design and performance of highway pavements. **(06 Marks)**

b. Plate bearing tests were conducted with 75cm diameter plate on soil subgrade and a granular base. The stress noticed, when the deflection was 0.25cm on the subgrade soil was 0.07MN/m^2. On the base course, the same plate yielded 0.25cm deflection under a stress of 0.14MN/m^2. Design the pavement for an allowable deflection of 0.5cm, under a wheel load of 40kN. And a tyre pressure of 0.5MN/m^2 [Refer Fig.Q.2(b)]. **(14 Marks)**



Relationship of F_2 and $\frac{h}{a}$ in a Two-aLyer System (Burmister Method)

Fig.Q.2(b)

3 a. Write the Mc-Leod's procedure for determining equivalent wheel load factors. **(10 Marks)**

b. Calculate the design repetitions for 20 year period for various wheel loads equivalent to 22.68kN. Wheel load using the following survey data on a 4 lane road. **(10 Marks)**

Wheel load kN	ADT both directions	% of traffic volume
22.68	Traffic	13.17
27.22	Volume	15.30
31.75	Considering	11.36
36.29	Growth	14.11
40.82	= 215	6.21
45.36		5.84

4 a. Explain briefly CBR method by cumulative standard axle load for the design of flexible highway pavements. **(10 Marks)**

b. Design a flexible highway pavement section on triaxial method (Kansas method) using the following data wheel load = 44kN, Radius of contact area = 160mm, Traffic coefficient X = 1.7, Rainfall coefficient y = 0.95, Design deflection = 2.8mm, E-value of subgrade soil $E_s = 100 \times 10^2 kN/m^2$, E-value of base course material, $E_b = 400 \times 10^2 kN/m^2$, E-value of 75mm thick bituminous concrete surface course = $1000 \times 10^2 kN/m^2$. **(10 Marks)**

PART – B

5 a. Explain the following:

i) Radius of relative stiffness

ii) Radius Resisting section

iii) Modulus of subgrade reaction

iv) Fatigue behavior of concrete. **(10 Marks)**

b. Calculate the stresses at interior edge and corner regions of a C-C pavement using Westerguard's stress equation for the following data:

Wheel load = 51kN, modulus of elasticity of concrete = $0.3 \times 10^8 kN/m^2$, Poisson's ratio of concrete = 0.15, pavement thickness = 18cm, Modulus of sub grade reaction = $6.0 \times 10^4 kN/m^3$ radius of contact area = 15cm. **(10 Marks)**

6 a. What are the uses of tie bar in CC pavements? Indicate the steps in the design of tie bars with sketches. **(10 Marks)**

b. Determine the spacing between contraction joints for 3.5m slab width having thickness of 20cm consider the following 2 cases.

i) For plain cement concrete

ii) For reinforced cement concrete

Take f = 1.5, γ for CC = $24kN/m^3$, Allowable tensile stress in CC = $80kN/m^2$, Allowable tensile stress in steel = $6 \times 10^4 kN/m^2$, $\gamma = 75kN/m^3$. Total reinforcement of $60N/mm^2$ is provided and is equally distributed in both the directions, show the detail with a sketch. **(10 Marks)**

7 a. Describe the general causes of flexible pavement failures. **(05 Marks)**

b. Explain the following:

i) Alligator cracking

ii) Reflection cracking. **(05 Marks)**

c. Describe the step by step procedure of conducting Benkelman beam deflection studies for structure evaluation of flexible pavement and subsequent determination of overlay thickness. **(10 Marks)**

8 a. Explain the causes and maintenance of the following in rigid pavements:

i) Crack ii) Joints. **(10 Marks)**

b. Explain the common types of failure in rigid pavement. **(10 Marks)**

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