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10CV833

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Bring out a comparison between highway and airfield pavements. **(06 Marks)**

b. Briefly describe the principles adopted in design of flexible and rigid pavements. **(06 Marks)**

c. Draw the neat cross section of a flexible pavement and explain the functions of various layers. **(08 Marks)**

2 a. List the factors affecting pavement design. Briefly describe any two traffic factors affecting pavement design. **(06 Marks)**

b. List the principle, assumptions and limitations of Burmister's theory. **(06 Marks)**

c. A truck has wheel load of 51kN and radius of contact area 150mm. A bullock cart has a wheel load of 6kN and radius of contact area 25mm. Calculate the maximum stresses as a depth of 0, 50, 150 and 450mm from the top due to the loads assuming single layer elastic theory. Give your comments with respect to design and construction of flexible pavement to cater both type of traffic loads. Plot the vertical stress distribution. **(08 Marks)**

3 a. Explain the importance of wheel load and tyre pressure in pavement design. Which one is more important and why? **(06 Marks)**

b. Explain with equations, how is ESWL in flexible pavements determined by
i) Equal deflection
ii) Equal stress methods. **(06 Marks)**

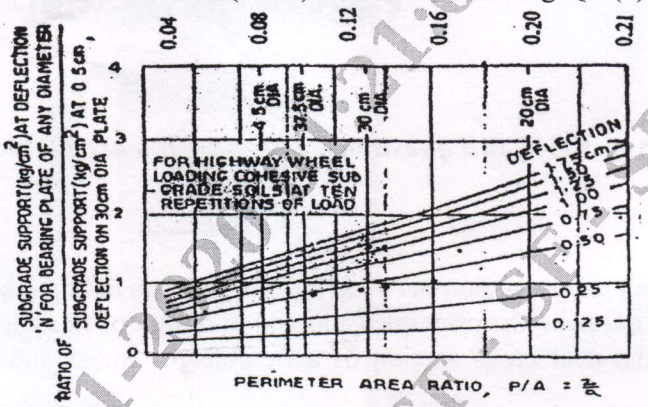
c. Calculate the EWL for the following data and design life of 15 years:

Wheel load kN	ADT, both directions	% growth of traffic/annum
35	1200	7
51	2800	8
55	1850	9.5
70	900	8.5
90	250	6.5

(08 Marks)

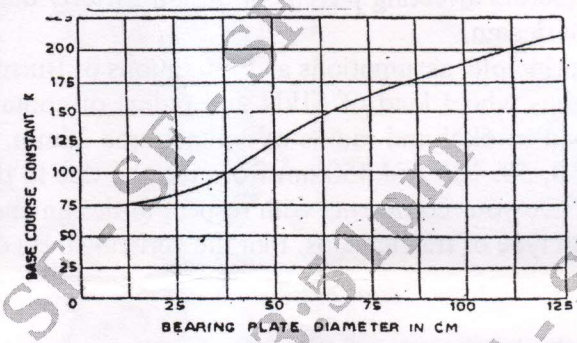
4 a. With an equation, describe how Cumulative Standard Axels (CSA) is computed for use in CBR method of pavement design. **(04 Marks)**

b. Design a highway pavement for a wheel load of 5100 kg (51 kN) with a tyre pressure of 5.0kg/cm^2 (0.5N/mm^2) by McLeod method. The plate bearing test was conducted on subgrade soil using 30cm dia. plate which yielded a pressure of 2.5kg/cm^2 (0.25N/mm^2) after 10 repetitions of load at 0.5cm (5mm) deflection. Use Fig.Q.4(b)(i) and (ii). **(08 Marks)**



Reltationship of Subgrade Support with P/A ratio

Fig.Q.4(b)(i)



Relation between Plate Diameter and Base Course Constant

Fig.Q.4(b)(ii)

c. Design the pavement section by triaxial method using following data. Wheel load = 51kN, radius of contact area = 150mm, traffic coefficient = 1.5, rainfall coefficient = 0.9, design deflection = 2.5mm, E of subgrade = 10N/mm^2, E of base course = 40N/mm^2, E of 75mm thick bituminous concrete surface = 100N/mm^2. **(08 Marks)**

PART – B

5 a. What are the critical locations for stress determination in a CC slab? Describe the modified equations to determine wheel load stresses at these locations. **(08 Marks)**

b. Determine the warping stresses at interior, edge and corner regions in a 200mm thick CC pavement with a slab size of 4.6 × 3.5m, temperature difference between top and bottom of slab = 22°C. Assume E = 3.5 × 10^{4}N/mm^2, K = 0.06N/mm^3, μ = 0.15. Use chart 5b. **(12 Marks)**

L/l or B/l	C	L/l or B/l	C
1	0.000	7	1.030
2	0.040	8	1.077
3	0.175	9	1.080
4	0.044	10	1.075
5	0.720	11	1.050
6	0.920	12	1.000

Fig.Q.5b

6 a. Explain the different type of joints in CC pavements. Also explain the type and objective of using reinforcement at the joints. **(08 Marks)**

b. Design the dowel bars for given data:
Design load = 98th, percentile axel load = 8000kg, slab thickness = 33cm, joint width = 2cm, radius of relative stiffness = 103.53cm, compressive strength of concrete @ 28 days of curing = 400kg/cm^2, elastic modulus = 3×10^5kg/cm^2, $\mu = 0.15$. **(12 Marks)**

7 a. What is the need for highway maintenance? List the general causes of pavement failures. **(06 Marks)**

b. List the common types of flexible pavement failures and explain any two of them. **(06 Marks)**

c. Existing black top pavement was tested using Benkleman beam with a test vehicle of 102kN axel load. The observations recorded at a pavement temperatures of 43°C are given below, for 12 sections. Compute the thickness of B.C overlag taking allowable deflection as 1.25mm, the factor of subgrade moisture content is 2.

1.46	1.52	1.56	1.76	1.96	1.74	1.68
1.74	1.96	1.42	1.56	1.62		

(08 Marks)

8 a. List the effects due to deficiency of pavement materials and structural inadequacy in CC pavements. **(08 Marks)**

b. Explain the common type of failures in CC pavements. **(12 Marks)**

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