CBCS SCHEME

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18CV825

Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Pavement Design

Time: 3 hrs. Max. Marks: 100

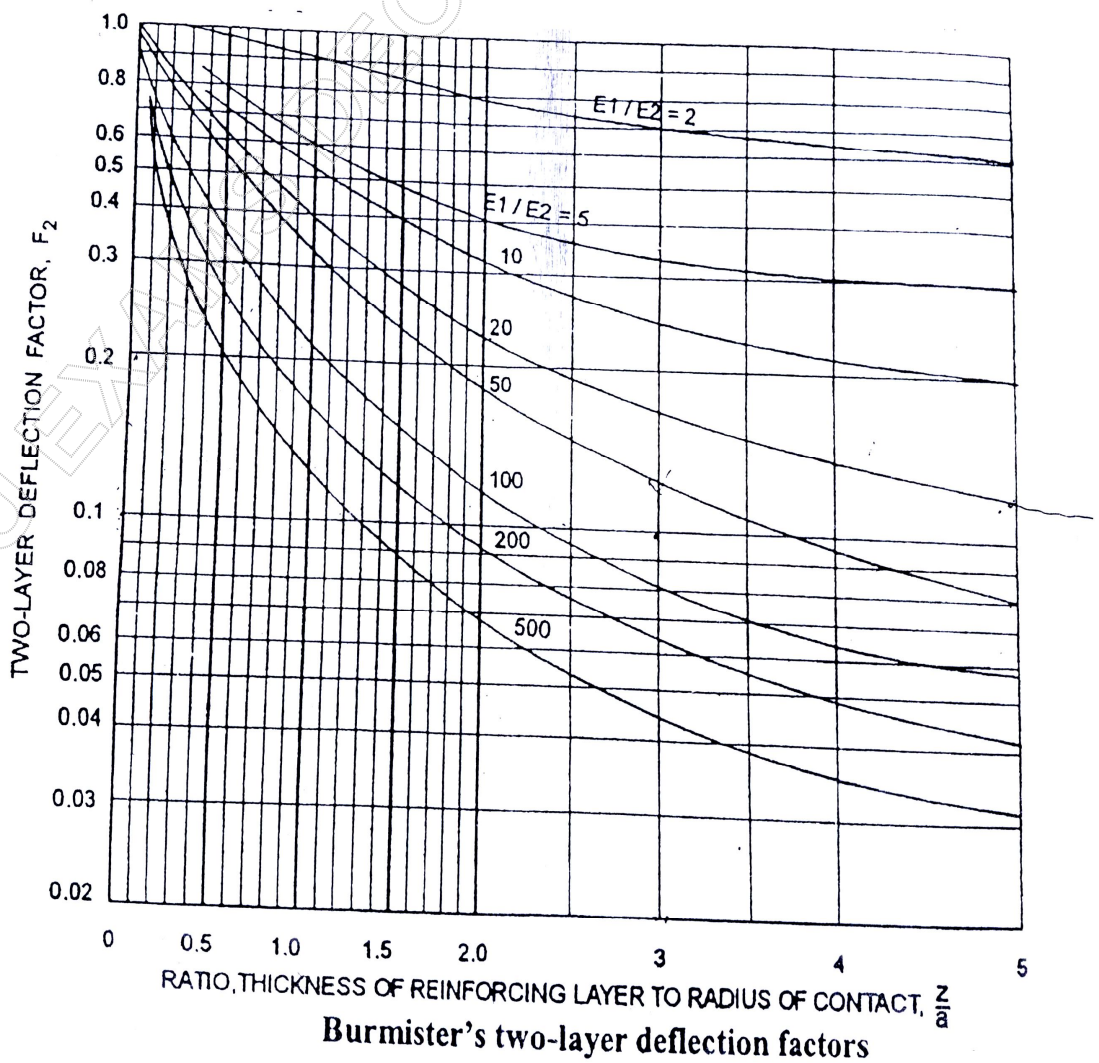
Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Use charts for data to solve problems.

Module-1

1 a. Briefly explain the pavement components. **(06 Marks)**

b. Write the difference between highway pavement and airfield pavement. **(06 Marks)**

c. A plate bearing test were conducted with 30cm plate dia on soil subgrade and over 15cm base course. The pressure yielded at 0.5cm deflection is 1.25kg/cm^2 and 4.0kg/cm^2 respectively. Design the pavement section for 4100kg wheel load with tyre pressure of 5kg/cm^2 for an allowable deflection of 0.5cm using Burmister's approach. **(08 Marks)**



Burmister's two-layer deflection factors

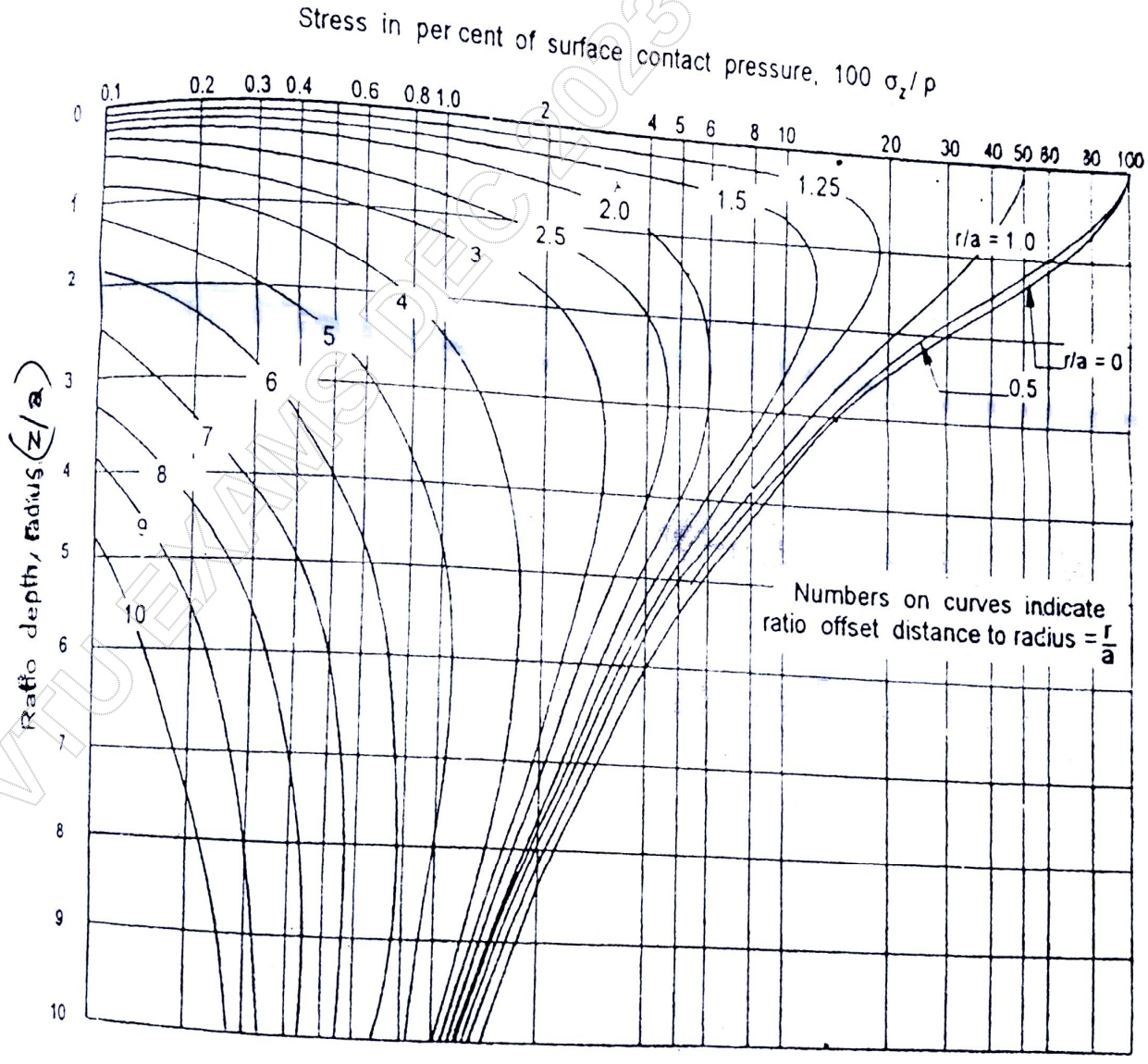
Fig.Q1(c)

OR

2 a. Compare the flexible pavements and rigid pavement. **(06 Marks)**

b. Briefly explain the functions of subgrade, subbase, Base course, Surface course. **(06 Marks)**

c. A circular load of radius 15cm with uniform contact pressure of 7.0kg/cm^2 is applied on the surface of a homogenous elastic mass. Determine the vertical stress under the centre of the load at a depth of 45cm from the surface. **(08 Marks)**



Vertical stress distribution chart (single layer)

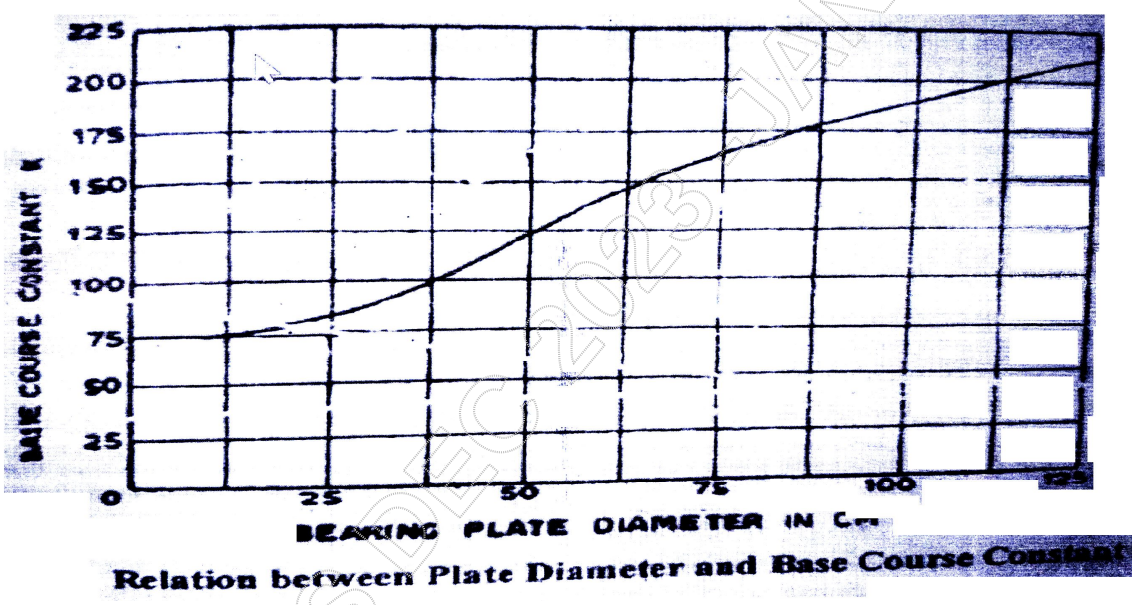
Fig.Q2(c)

Module-2

3 a. Compute the ESWL of a dual wheel assembly carrying 20.5kN each for pavement thickness of 150mm, 200mm and 250mm. Center to center tyre spacing is 270mm, clear distance between the walls of dual tyre 110mm. **(06 Marks)**

b. Explain the concept of Equivalent Single Wheel Load [ESWL]. **(06 Marks)**

c. Design a highway for a wheel load of 4100kg with a tyre pressure of 5kg/cm^2 by Mc Leod method. The plate bearing test carried out on subgrade soil use 30cm dia plate yielded by a pressure of 2.5kg/cm^2. After 10 repetition of load at 0.5cm deflection. **(08 Marks)**



Relation between Plate Diameter and Base Course Constant

Fig.Q3(c)(i)

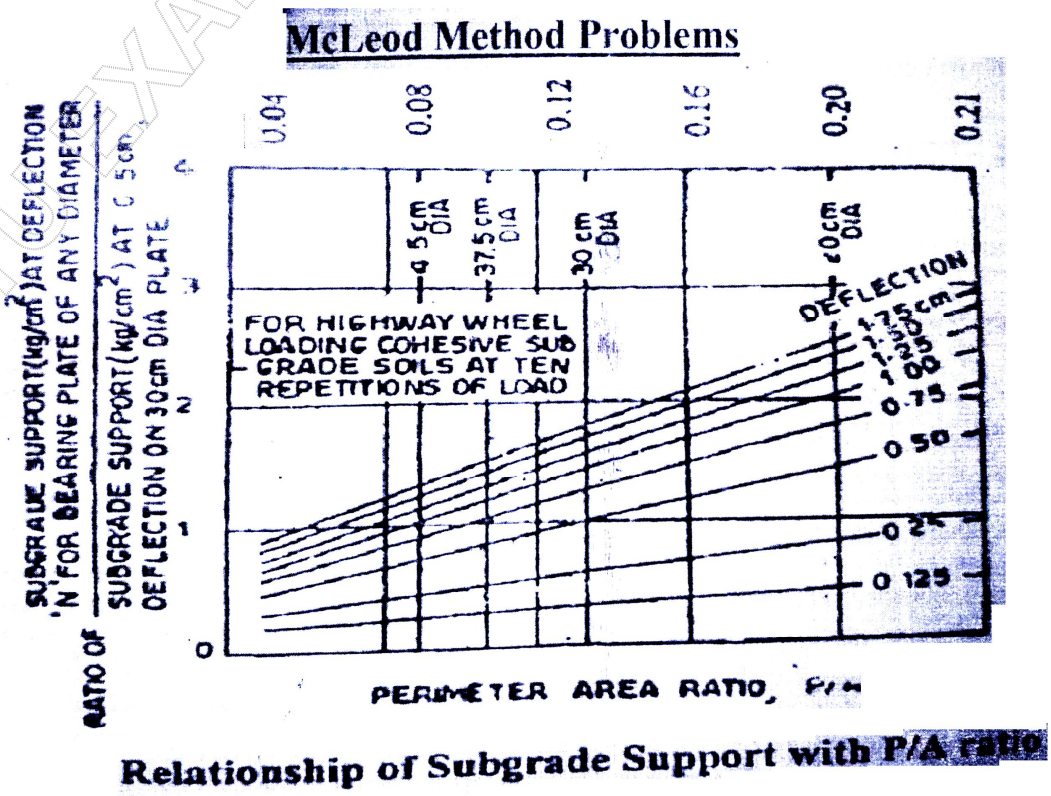


Fig.Q3(c)(ii)

OR

4 a. Calculate the design repetition for 20-year period for various wheel load equivalent to 22.68kN wheel load using the following traffic survey data on two lane road.

Wheel load, kN	22.68	27.22	31.75	36.29	40.82	45.36
Vol. of each wheel load per day	28	33	25	30	13	13

(10 Marks)

b. Design the pavement section by Triaxial test method using the following data :

i) Wheel load = 41kN
ii) Tyre pressure = $0.75N/mm^2$
iii) Traffic co-efficient, X = 1.5
iv) Saturation co-efficient, Y = 0.6
v) Design Deflection, Δ = 2.5mm
vi) E – value of subgrade, E_s = $10N/mm^2$
vii) E – value of base course, E_b = $25N/mm^2$
viii) E – value of 60mm thick bituminous course, E_{bc} = $100N/mm^2$. **(10 Marks)**

Module-3

5 a. List the general causes of flexible pavement failures and analyse the failure with respect to subbase and base course. **(06 Marks)**

b. Explain briefly the various maintenance works of bituminous surfaces. **(06 Marks)**

c. Benkelman beam deflection studies were carried out on a highway pavement with 50mm thick bituminous surface course, when the mean pavement surface temperature was 40°C and the field moisture content of subgrade soil was 5.5(%) percent. The soil is found to be sandy and the annual rainfall of the region is 950mm.

The characteristic deflection value, Dc if the selected sub-stretch is found to be 1.32mm. Determine the corrected deflection value after applying the corrections for temperature and seasonal variation in subgrade moisture. **(08 Marks)**

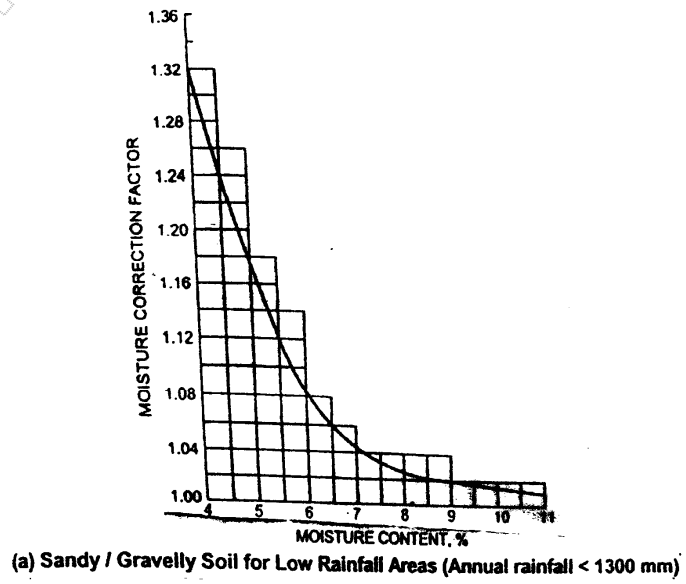


Fig.Q5(c)

OR

6 Write a note on :

a. Falling weight deflectometer. **(06 Marks)**

b. Benkelman beam deflection method. **(06 Marks)**

c. Functional evaluation by visual inspection and unevenness measurement. **(08 Marks)**

Module-4

7 a. Explain:
i) Temperature stresses
ii) Frictional stresses
iii) Critical stresses. **(06 Marks)**

b. Write the Westerguards stress equation for wheel load stresses and write the assumptions. **(06 Marks)**

c. Calculate the wheel load stress at critical section by IRC stress equation using the following data :

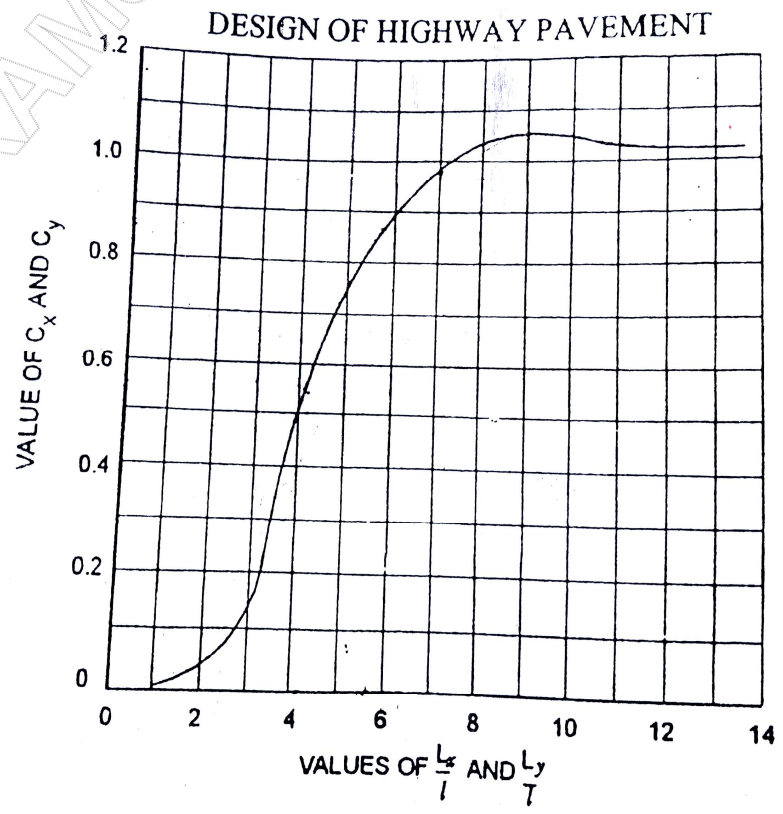
Design wheel load, (P)	= 51kN
Tyre pressure (P)	= 0.72N/mm^2
E-value of concrete	= 30kN/mm^2
Modulus of subgrade reaction (K)	= 0.1N/mm^2
Slab thickness = (h)	= 250mm
Poisson's ratio, μ	= 0.15.

(08 Marks)

OR

8 a. Explain :
i) Radius of relative stiffness
ii) Equivalent radius of resisting section
iii) Modulus of subgrade reaction. **(10 Marks)**

b. Determine the warping stress in a 25cm concrete pavement with 12m transverse joint width of lane is 3.6m and temperature differential between top and bottom of concrete slab is 15°C. For concrete E = 3.2 × 10^{5}kg/cm^2, μ = 0.15 and K = 5kg/cm^3 use stress chart. **(10 Marks)**



Warping stress coefficient chart (by Bradbury)

Fig.Q8(b)

Module-5

9	a.	Explain the rigid pavement failures and its causes.	**(10 Marks)**
	b.	Explain different methods of pavement functional evaluation.	**(10 Marks)**

OR

10	a.	Explain the neat sketches, the various types of joints in C.C. pavements and its function.	**(10 Marks)**
	b.	Explain the various types of remedial measures in C.C. pavements and their uses.	**(10 Marks)**

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