B.E. CONSTRUCTION ENGINEERING THIRD YEAR SECOND-SEMESTER EXAM 2022
Subject Code: CON/PC/B/T/325

Subject: Highway Engineering   Full Marks: 50

Part -I

Instructions:
1. Answer **ALL** questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

Q1. Prepare a set of questionnaires related to qualitative assessment of different types of bituminous mix including its constituent materials and explain the judiciousness of your selection for the same. Does Portland cement, if used in bituminous mix improve strength? How bituminous mix is designed based on Marshall Design approach. **(CO2)**

(20)

Q2. How the subgrade, base and sub base materials can be characterized? Explain from a highway engineer's perspective. Explain the limitations of CBR and Plate load test. **(CO1)**

OR

Enumerate innovative application and advantage and disadvantage of binder modification? Prepare a check list/ scheme for the development of alternative materials to be used in highway constructions. **(CO1)**

·(15)

Q3. The number of tests for VG Bitumen is less than that of Penetration Grade. How would this give assurance about the quality of Bitumen? What are the essential features of cold mix in comparison with other types of mix, explain with your engineering judgment. **(CO1)**

OR

Mention three grade of bitumen, in general use on road work and say where and why each grade is suitable? State the significance of softening point and bitumen viscosity test. **(CO1)**

(15)

B.E Construction Engineering 3rd year 2nd semester examination 2022

Highway Engineering

REF: EX/CON/PC/B/T325/2022

Part-II

Full Marks-50   Time – 3 hours

Assume relevant data if required

Answer Question -1 and any two from the rest.

In this paper where numerical data contains the word A means the last digit of your examination roll number to used in that numerical data.

Q-1. Calculate the overlay thickness required with DBM for an existing four lane state highway located near Kolkata. The present traffic on road is 167A cvpd. The Benkelman beam deflection survey data are given below. The day temperature recorded on the day of survey was 38°C . The subgrade PL=16 %, LL= 34% and the field moisture content as 14 % .

Recorded pavement deflection (mm) are as following

1.5, 2.1, 0.75, 0.99 , 1.12, 1.97, 2.04, 2.65, 1.34, 1,76,1.43, 1.86, 3.01, 2.94, 2.86, 2.56, 1.55, 0.89, 0.75, 1.29.

(14)

Q-2. Determine the required thickness of concrete slab for a low volume concrete road pavement on a subgrade with CBR of 4% located at Digha in West Bengal. The traffic road may be considered as 25A CVPD .

Use following data presented in the tables below

Soaked Sub-grade CBR (%)   2 3 4 5 7 10 15 20 50
K value over GSB MPa /m   25 34 42 50 58 60 74 83 170

Bradbury's coefficient

$\frac{L}{\ell}$	1	2	3	4	5	6	7	8	9	10	11	12 & above
C	0.000	0.040	0.175	0.440	0.720	0.920	1.030	1.077	1.080	1.075	1.050	1.000

Temperature differentials for slab thickness of 150 mm, 200 mm and 250 mm

ii)	Bihar, Jharkhand, West Bengal, Assam and Eastern Orissa excluding hilly regions and coastal areas	15.6	16.4	16.6

(18)

Q-3 (a) Calculate the design traffic and for a new four lane highway to be constructed within two years near Kolkata. The present traffic on road is considered as 180A cvpd. (5)

(b) Explain and calculate the effect of overloading in service life of road in years, if the VDF value after 5 years become 8.A. (6)

(c) Explain the causes of failure of flexible road pavement under rutting and fatigue. (7)

Q-4. (a) Explain the significance of different types of joints used in concrete pavement. (8)

(b) Explain the significance of top down and bottom up cracks in concrete road pavement. (6)
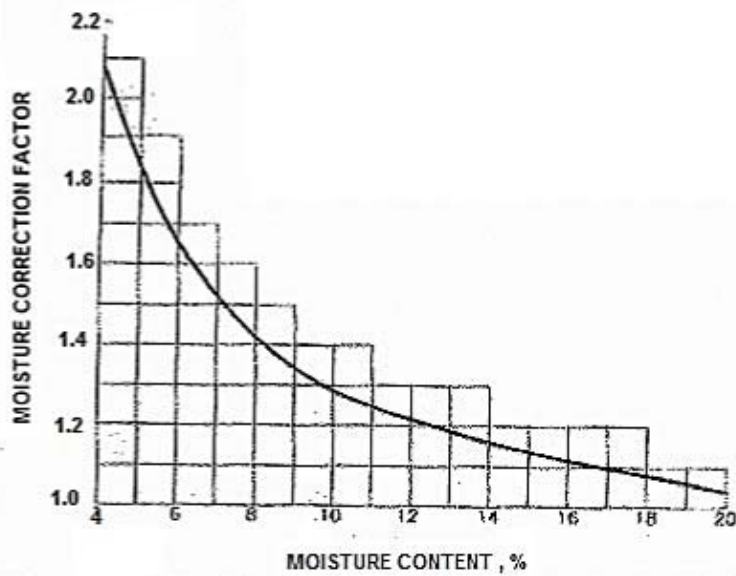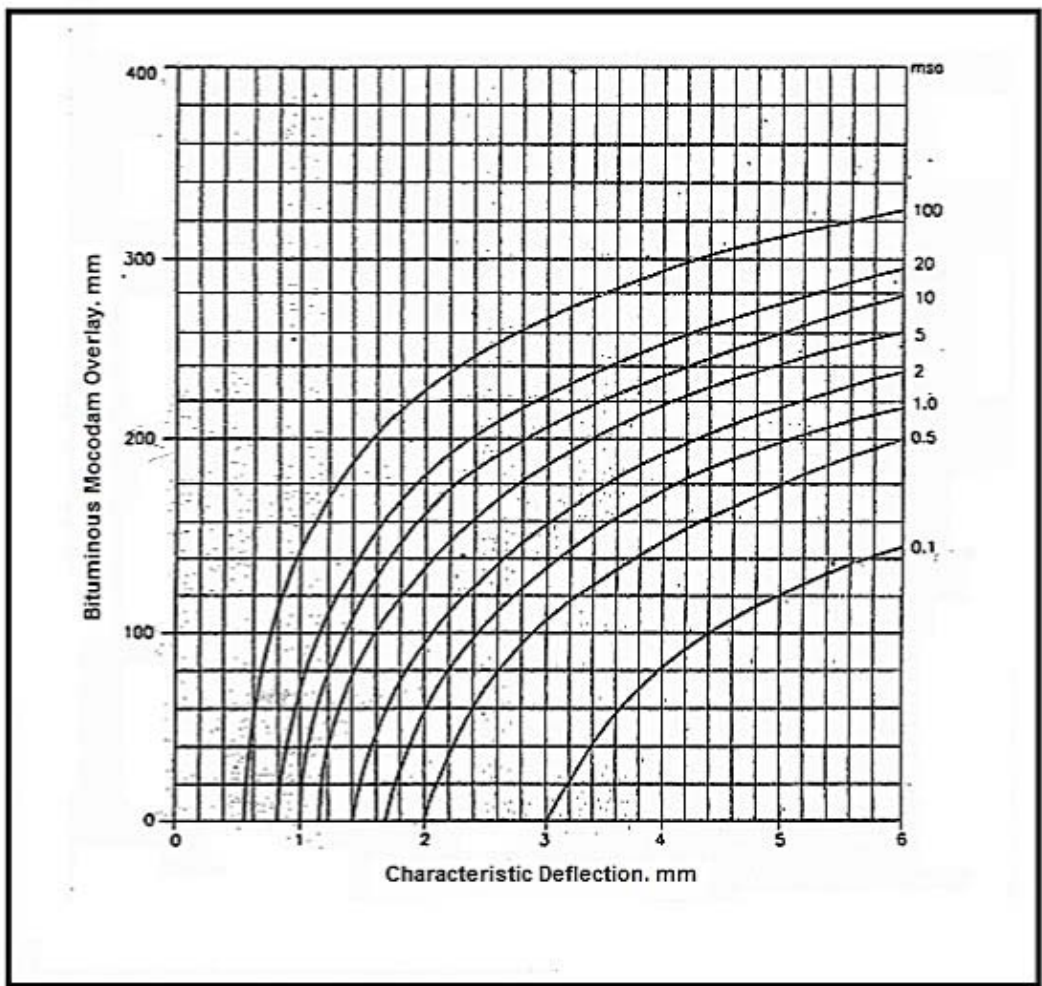
(c) Write notes on PQC. (4)

Fig. 7. moisture correction factor for clayey subgrade with high plasticity (P1 >15) for high rainfall areas (Annual rainfall > 1300 mm)

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