

BE (Civil) - SEM VII (Scheme)

(3 Hours)

[Total Marks : 80]

20/12/23
90+2=51

N.B:

1. Question No ONE is Compulsory
2. Attempt any Three from remaining five questions
3. Assume suitable data wherever required.
4. Figures to the right indicate full marks.

1. Attempt any four of the following
 - a) Define Resilience modulus, resilience strain and resilience deformation. [20]
 - b) Why is the CBR value determined at 2.5mm penetration generally greater than the CBR determined at 5mm penetration? Why is surcharge weight used for testing of soil sample by the CBR method? [05]
 - c) Explain how shape test is important in pavement design. [05]
 - d) How low cost roads are classified as per IRC. [05]
 - e) Define the term soil stabilization. What are the broad categories of soil stabilization? [05]
 - f) According to ASHTO guidelines apply necessary corrections to the K value based as per following plate load test data carried out with 55 cm diameter plate. Correction factor for saturation is 0.74. Correction factor of measured diameter of plate is 2.3 [05]
 2. a) State the desirable properties of bitumen and explain their significance in pavement design with IRC references. [10]
 - b) Benkelman Beam deflection studies were carried out on 15 selected points on a stretch of flexible pavement during summer season using a dual wheel load of 4085 kg. 5.6 kg/cm² pressure. The deflection values obtained in mm after making the necessary lag corrections are given below. If the present traffic consists of 750 commercial vehicles per day, determine the thickness of bituminous overlay required, if the pavement temperature during the test 30°C and the correction factor for subsequent increase in subgrade moisture content is 1.3. Assume annual rate of growth of traffic as 7.5%. Adopt IRC guidances. [10]
- 140, 1.32, 1.25, 1.35, 1.48, 1.60, 1.65, 1.55, 1.45, 1.40, 1.36, 1.46, 1.50, 1.52, 1.45 mm
3. a) Resilient modulus was conducted on granular soil. The specimen of granular soil was conditioned and failed after 192 repetitions of the deviator stress. Determine the (i) Elastic Strain (ii) Resilient modulus (iii) Bulk stress from the following resilient modulus test data. Take initial reference depth of the sample as 100mm. [10]

Pore water pressure (kPa)	Deviator stress (kPa)	Elastic Deformation ($\times 10^{-3}$ mm)
103.42	6.89	8.1788
	13.79	15.1384
	68.95	75.9460
	103.42	106.9340
6.89	6.89	17.5006
	13.79	25.1714
	68.95	101.3460
	103.42	133.6040

- b) Differentiate between Indian method and Superpave method of mix designs [10]

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4. a) Explain the step by step procedure for the selection of optimum asphalt binder content by Marshall Method [10]
 b) Derive the expression for the bulk specific gravity of combined aggregates from the 3Phase diagram of the bituminous concrete mix. [10]
 Calculate the bulk specific gravity of combined aggregates from following data:

Aggregate type	Bulk specific gravity	Proportion in Mix
Coarse aggregate	2.61	54.5
Fine aggregate	2.71	38
Mineral filler	2.69	7.5

5. a) Classify the soil as per HRB system. Discuss the suitability of the following grade of soil as subgrade materials with reference to stability, volume changes and drainage. A-1, A-2-7, A-3, A-7-2, A-5, A-6-4 [10]
 b) What are the methods adopted to ensure the quality of pavements during construction [10]
6. a) Examine the different methods of proportioning of aggregates and enumerate significance of proportioning in highway pavement design. [10]
 b) What is FHWA .45 power gradation curve? Draw the FHWA 0.45 power gradation curve from the following set of sieve sizes (mm). [10]

26.5	19.0	13.2	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075
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