Ref. No.: Ex/CE/T/423D/2019

B. E. CIVIL ENGINEERING 4TH YEAR 2ND SEMESTER EXAMINATION 2019

PAVEMENT DESIGN EVALUATION AND MANAGEMENT (ELECTIVE – II)

Time: 3 Hours **Full Marks: 100**

Part I **60 marks**

Use Separate Answer scripts for each Part

Answer ALL Questions

Answer brief & to the point. Assume standard value for any parameter, if required

1.

a. Highlighting the significance in highway construction, write short notes on – 5×4

i. Adhesion between Aggregates and Bitumen
ii. Flakiness and Elongation of Aggregates
iii. Ductility of Bitumen
iv. Voids in Bituminous Mix

b. A bituminous concrete mix was designed by standard Marshal Method using a standard mould. The proportion of Coarse Aggregates, Fine Aggregates and Fines were 49%, 45% and 6% respectively. The specific gravities of the aggregate solids and Bitumen were found to be 2.72, 2.65, 2.60 and 1.01 respectively. The maximum specific gravity of mix may be determined considering no loss of bitumen and absence of any non-penetrable voids.

The accepted values may be taken as – Minimum Stability = 7.0 kN; Maximum Flow = 2.0 mm; Minimum VMA = 10%; VA = 3% to 5% and VFB = 60% to 75%. Determine the optimum bitumen content from the following results – 25

Bitumen Content (as percentage of aggregate)	4.5	4.75	5	5.25
Wt of Sample in air (gm)	1219	1230	1237	1241
Stability (kN)	8.335	9.164	9.164	8.247
Flow (mm)	1.9	2.1	2.5	3.1

2.

a. Explain one major purpose for quality assessment of a rigid pavement and a flexible pavement. 6

b. A Benkleman Beam Deflection Test was carried out for design of pavement overlay. Determine the characteristic deflection value of the pavement which is placed over a subgrade having moisture correction factor of 1.25 9

Set	1	2	3	4	5	6	7	8	9	10
Initial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Intermediate	0.50	0.48	0.46	0.50	0.56	0.54	0.53	0.54	0.53	0.54
Final	0.51	0.50	0.49	0.51	0.57	0.56	0.56	0.56	0.54	0.55

Ref. No.: Ex/CE/T/423D/2019

B.E. CIVIL ENGINEERING (PART TIME) FIFTH YEAR SECOND SEMESTER– 2019

Subject: PAVEMENT DESIGN, EVALUATION AND MANAGEMENT **Time: 3 Hours**

Full Marks: 40

Part – II

Instructions: Use Separate Answer Scripts for each Part
No code or chart is allowed.
Answer all questions.

1. (a) What do you mean by Mechanistic Empirical pavement Design process? (3)
(b) State the unique features of pavement design followed by AASTHO with comparison of IRC 37. (4)
(c) What are the parameters on which Horizontal tensile strain of the pavement depends? Also suggest the approximate values of those parameters. (4)

2. (a) Define Fatigue and Rutting failure of pavement and draw necessary sketches. (6)
(b) Indicate the differences between dowel and tie bar. (4)
(c) The maximum temperature variation of a temperature zone is said to be 25^0C. Thermal expansion coefficient is assumed to be $10^{-5}/^0$C. Find out the spacing between expansion joint. (4)

3. Design Flexible pavement with the help of AASTHO method based on the following data: (15)
W_{18}= 13,000,000
M_R of subgrade, Subbase, Base and Bituminous layers are given as 4500psi, 16000 psi, 32000 psi and 460,000 psi. Initial PSI = 4.2, Terminal PSI = 2.0. Drainage coefficients of Base and Subbase layers are given as 1.15 and 0.90 respectively. Z_r = -1.645, S_o = 0.40. Layer coefficients of surface, base and subbase layers are given as 0.44, 0.14 and 0.11respectively.

$$\log_{10} W_{18} = (Z_r \times S_o) + 9.36\log_{10}(SN+1) - 0.2 + \left(\frac{\log_{10}\left(\frac{\Delta PSI}{4.2-1.5}\right)}{0.40 + \left(\frac{1094}{(SN+1)^{5.19}}\right)} \right) + 2.32\log_{10}(M_R) - 8.07$$