Ref. No.: Ex/CE/5/T/505D/2017

B. CIVIL ENGINEERING (EVENING) 5TH YEAR 2ND SEMESTER EXAMINATION 2017

ADVANCED TRANSPORTATION ENGINEERING (ELECTIVE – II)

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

(50 marks for each part)

Part I

Use Separate Answer scripts for each Part

Answer ALL Questions

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

1. Write short notes on the following 3×4
   a. Durability Testing of Bitumen
   b. Flakiness & Elongation of Aggregates
   c. Rutting

2. What is the Viscosity at 60°c of a bitumen sample, having standard penetration of 22 and softening point of 55°c. 5

3. Determine the characteristic BBD value of the pavement from the following Benkelman Beam Deflection Test results (in mm) conducted at an average temperature of 33°c and over a subgrade having moisture correction factor of 1.25. 8

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

4. A bituminous concrete mix was designed in a standard Marshal mould of 100mm diameter and 64mm height. The proportion of Coarse Aggregates, Fine Aggregates and Fine Soils in a 20down mix of aggregates were taken following Fuller's Postulate with n=0.4. The specific gravities of these aggregate solids and Bitumen were found to be 2.7, 2.65 & 2.6 and 1.05 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 = 7.5KN; Flow = 1.75mm to 2.25mm; Minimum VMA = 11%; VA = 3% to 5% and VFB = 60% to 75%. Design the optimum bitumen content from the following results 25

	Bitumen Content (as percentage of aggregate)			
	4.25	4.75	5.25	5.75
Wt of Sample in air (gm)	1190	1219	1237	1242
Stability (kN)	6.098	8.335	9.164	7.018
Flow (mm)	1.7	1.9	2.5	3.8

B.E. CIVIL ENGINEERING (PART TIME) FIFTH YEAR SECOND SEMESTER (OLD) – 2017

Subject: ADVANCED TRANSPORTATION ENGINEERING **Time: 3 Hours**

Full Marks: 50

Part – II

Instructions: Use Separate Answer Scripts for each Part
IRC 37: 2012 code is allowed. No other code or chart is allowed.
Answer all questions.

1. (a) Differentiate between Flexible and Rigid pavements. Enumerate the various methods of flexible pavement design.
(b) Design the pavement according to IRC: 37 (2012) for a new road in plain terrain with a two-lane single carriageway; given the following data:
Traffic volume in the year of last vehicle count in both direction = 500 commercial vehicles per day (CVPD)
Traffic growth rate per annum = 7.0%
Design life = 15 years
Design CBR value of subgrade soil = 4%
Vehicle Damage Factor =3.5
Construction period = 5 years.
Assume any other data
(5+3+7)

2. (a) Calculate ESWL of a dual wheel assembly carrying 2050 kg each for pavement thickness of 20, 25 and 30 cm. Centre to centre tyre spacing = 30 cm and distance between the walls of the tyres = 12 cm.
(b) For a 25 cm thick cement concrete pavement (Rigid pavement), analysis of stresses give the following values:
(9+6)
Wheel load stress due to edge loading = 32 kg/cm^2
Warping stress at edge region during winter = 6 kg/cm^2
Warping stress at edge region during summer = 8 kg/cm^2
Frictional stress during summer = 5 kg/cm^2
Frictional stress during winter = 4 kg/cm^2
Calculate the most critical stress value for this pavement at summer and winter season.

3. Discuss the difference in application of Dowel and Tie bars in Rigid pavement (with neat sketches)
Design the size and spacing of dowel bars at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm, for a design wheel load of 5040 kg. Assume load capacity of the dowel system as 40% of the design wheel load. Joint width is 2.5 cm, permissible flexural stress in dowel bar is 1400 kg/cm^2 and permissible bearing stress in CC is 100 kg/cm^2. Assume load transfer capacity of a single dowel bar as 750 kg (irrespective of bar diameter).
Assume any other data if necessary.
(5+15)