MAY 2022 - ENDSEM EXAM
FINAL. YEAR B. TECH. (CIVIL) (SEMESTER - II)
COURSE NAME: ADVANCED TRANSPORTATION ENGINEERING
COURSE CODE: CVUA40181B
(PATTERN 2018)

Time: [1 Hour] [Max. Marks: 30]

(*) Instructions to candidates:

1) **Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6.**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

MARKING SCHEME & SOLUTION

Question No.	Question Description	Marks
Q.1 a	List – 2 Marks Sketch – 2 Marks	4
Q.1 b	Types -4 Significance -2 Marks	6
	OR	
Q2 a	Significance of Level of Service 'A' and 'F' – 2 marks Sketch – 2 Marks	4
Q2 b	Solution – Total No. of Vehicles – 3750 a. Two wheelers – 2000 – 53.3% - **0.75** x2000 = **1500 PCU** – 1 mark b. Cars – 800 -21.3% - **1.0** x 800 = **800 PCU** – 1 mark c. Buses – 500 – 13.3% - **3.7** x 500 = **1850 PCU** – 1 mark d. Auto – 350 – 9.3% - **1.20** x 350 = **420 PCU** – 1 mark e. Cycle -100 – 2.67% - **0.40** x 100 = **40 PCU** – 1 mark PCU using IRC 106-1990 – **4610 PCU** – 1 mark	6
Q.3 a	Necessity – 1 mark x 4 points	4
Q.3 b	Typical layers of a flexible pavement – 1 Mark x 5 Points Neat sketch – 1 Mark with Label.	6
	OR	
Q.4 a	1 mark x 4 points	4
Q.4 b	Solutions 1. Distribution factor = 0.75 2. $N = 365 \times \{(1 + 0.05)^{15} - 1) \times 300 \times 0.75 \times 2.5/ 0.05 = 4430348.837 = 4.4$ msa 3. Total pavement thickness for CBR 4% and traffic 4.4 msa from IRC:37 2001 chart1 = 580 mm 4. Pavement composition can be obtained by interpolation from Pavement Design Catalogue (IRC:37 2001). (a) Bituminous surfacing = 20 mm PC + 50 mm BM (b) Road-base = 250 mm Granular base (c) sub-base = 280 mm granular material	6
	OR	
Q.5 a	Failure criteria of Rigid pavement – 1 mark x 4 points	4
Q.5 b	Solution: Radius of relative stiffness (l) is given by:	6

	$l=\left[\frac{Eh^3}{12K(1-\mu^2)}\right]^{\frac{1}{4}}=\left[\frac{3.0x10^5 x18^3}{12x6(1-0.15^2)}\right]^{\frac{1}{4}}=70.6cm$ The equivalent of resisting section is given by: a/h = 15/8=0.833 <1.74 $b=\sqrt{1.6a^2+h^2}-0.675h$ $=\sqrt{1.6x15^2+18^2}-0.675x18=14.0cm$ Stress at the interior, (Si) $S_i=\frac{0.316P}{h^2}\left[4\log 10\frac{l}{b}+1.069\right]$ $=\frac{0.316x5100}{18^2}\left[4\log 10\left(\frac{70.6}{14.0}\right)+1.069\right]=19.3kg/cm^2$ Stress at the edge, (Se) $S_e=\frac{0.572P}{h^2}\left[4\log 10\frac{l}{b}+0.359\right]$ $=\frac{0.572x5100}{18^2}[4x0.7027+0.359]=28.54kg/cm^2$ Stress at the corner (Sc) $S_c=\frac{3P}{h^2}\left[2-\left(a\frac{\sqrt{2}}{l}\right)^{0.6}\right]$ $=\frac{3x5100}{18^2}\left[1-\left(\frac{15\sqrt{2}}{70.6}\right)^{0.6}\right]=24.27kg/cm^2$	
	OR	
Q.6 a	Distinguish wheel load stresses and temperature stresses in rigid pavement. – 2 Marks x 2 points	4
Q.6 b	(Solution:) Given h=18 cm, b=7.2/2=3.6m, Ss = 1700 kg/cm2 W = 2400 kg/cm2 f = 1.5 S b = 24.6 kg/cm2. Step 1: diameter and spacing: Get As from $A_s=\frac{3.6\times 18\times 2400\times 1.5}{100\times 1750}=1.33\ cm^2/m$ Assume ϕ = 1 cm, ⇒ A = 0.785 cm2. Therefore, spacing is 100×0.785 1.33 = 59 cm, say 55 cm Step 2: Length of the bar: Get Lt from $L_t=\frac{1\times 1750}{2\ 246}=36.0\ cm$ a. Ans] Use 1 cm ϕ tie bars of length of 36 cmi @ 55 cm c/c	6