

**Name of the Examinations: BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR FIRST SEMESTER - 2025**

Subject: TRANSPORTATION ENGG. -II

Time: 3 hours

Full Marks: 100

GROUP A

(Short Answer type questions)

Answer any five of the following:

(5×5 = 25)

1. Explain the Rutting failure criterion in the design of flexible pavement.
2. Explain briefly the principle of Burmister's two-layer theory and mention the advantages over the elastic single-layer theory for the analysis of flexible pavements.
3. Explain tyre pressure and contact pressure.
4. What are the various climatic factors that affect the design and performance of pavement? Explain briefly.
5. List and briefly describe any four objectives of asphalt mix design.
6. Write down the functions of dowel bar and tie bar.

GROUP B

(Long Answer type questions)

Answer any five of the following:

(5×15 = 75)

7. (a) What are the advantages and disadvantages of traffic rotary?
(b) Describe with neat sketch merging, diverging and weaving and traffic operation in a rotary.
(c) Discuss various traffic interchanges.
8. The following information was obtained from a transportation survey of a town. Develop a linear regression model for estimating the trips generated from a zone if the population in a particular zone increases to 50,000, predict the expected trip generation from that zone.

Traffic zone number	Population in the zone (thousands)	Total trips generated (in hundreds)
1	25	13
2	29	11
3	31	19
4	33	15
5	24	12
6	30	16
7	23	9
8	25	12

[Turn over

9. (a) What are the functions of individual layers of flexible pavement and rigid pavement?
 (b) A fixed time 2-phase signal is to be provided at an intersection having a North-South and an East-West road where only straight-ahead traffic is permitted. The design hour flows from the various arms and the saturation flows for these arms given in the following table:

	North	South	East	West
Design hour flow (q) in PCU s/hour	800	400	750	1000
Saturation flow (s) in PCU s/hour	2400	2000	3000	3000

Calculate the optimum cycle time and green time for the minimum overall delay. The intergreen time should be the minimum necessary for efficient operation. The time lost per phase due to starting delays of 2 seconds and the value of amber period of 2 seconds leads to a total loss of 8 seconds per cycle. Sketch the timing diagram for each phase.

[5+10]

10. A) Design the pavement for construction of a new bypass with the following data:
- Two lane carriage way
 - Initial traffic in the year of completion of construction = 400 CVPD (sum of both directions)
 - Traffic growth rate = 7.5 %
 - Design life = 15 years
 - Vehicle damage factor based on axle load survey = 2.5 standard axle per commercial vehicle
 - Design CBR of subgrade soil = 4%.

IRC:37-2001

PAVEMENT DESIGN CATALOGUE
PLATE 1 - RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 4%					
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	480	20 PC		225	255
2	540	20 PC	50 BM	225	265
3	580	20 PC	50 BM	250	280
5	620	25 SDBC	60 DBM	250	285
10	700	40 BC	80 DBM	250	330

- B) Explain ESWL and the concept in the determination of the equivalent wheel load. [10+5]

11. Using the data given below, calculate the wheel load stresses at (i) interior (ii) edge (iii) corner regions of a cement concrete pavement using Westergaard's stress equations. Also determine the probable location where the crack is likely to develop due to corner loading. Wheel load = 6000 kg, Modulus of elasticity of cement concrete, $E = 3.0 \times 10^5 \text{ kg/cm}^2$, Pavement thickness = 18 cm, Poisson ratio = 0.15, Modulus of subgrade reaction $K = 6 \text{ Kg/cm}^3$, Radius of contact area = 15 cm.
12. (a) List different tests on road aggregates mentioning their significance.
- (b) Discuss the desirable properties of paving bitumen. [10+5]