

**Name of the Examinations: BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR FIRST SEMESTER - 2024**

Subject: TRANSPORTATION ENGG. -II Time: 3 hours Full Marks: 100

Part -I

Instructions: Use Separate Answer scripts for each part. Answer any five questions. 5x10 =50

1. Write short notes on the following : (a) Rutting failure and (b) Fatigue failure.
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. What are the functions of individual layers of flexible pavement and rigid pavement?
3. The bulk-specific gravities of coarse aggregate, fine aggregate, and fines are found to be 2.5, 2.60 and 2.65, respectively. The specific gravity of bitumen is given as 1.10. For the preparation of the Marshall sample, their relative proportions used are 55, 30, 10, and 5% by weight, respectively. The mass of the sample measured in air is 1245.2g, the mass paraffin-coated sample in air is 1295.8 g, and the mass of the paraffin-coated sample in water is measured as 703.7g. Calculate (i) VMA (ii) VA (iii) VFB (iv) The bulk specific gravity of the mix (v) The percentage of absorbed bitumen.
The specific gravity of paraffin is 0.9, and the theoretical maximum specific gravity of the mix, obtained from the vacuum test is 2.441.
4. 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.
5. (a) Explain contact pressure, tyre pressure, and Equivalent Single Wheel Load.
(b) What are the various climatic factors that affect the design and performance of pavement? Explain briefly.
6. (a) List different tests on road aggregates mentioning their significance.
(b) Discuss the desirable properties of paving bitumen.

[Turn over

**BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FOURTH YEAR FIRST
SEMESTER – 2024**

Subject: TRANSPORTATION ENGINEERING – II

Time: 3 Hours

Full Marks: 50

Part – II

**Instructions: Use Separate Answer Scripts for each Part
Answer all questions**

1. Discuss about the following components of an airport (8)
 - a. Apron c. Hanger
 - b. Taxiway d. Runway
2. Spot speed studies were carried out at a stretch of highway and the combined data are as follows:

Speed range (kmph)	No. of vehicles observed	Speed range (kmph)	No. of vehicles observed	Speed range (kmph)	No. of vehicles observed
0-10	10	30-40	152	60-70	56
10-20	12	40-50	187	70-80	23
20-30	89	50-60	119	80-90	20

Determine (i) the maximum and minimum permissible speed limits for regulation of mixed traffic flow, (ii) design speed, (iii) most preferred speed. (15)

3. a. Derive the relation between Traffic Flow, Speed and Density. (5)
b. Speed density relation of a traffic stream is as follows: (9)
 $U = 57.5 (1 - 0.008k)$
Calculate jam density, free flow velocity and capacity of the stream.

4. a. Define Cycle and Phase related to design of signal. Illustrate a 4 phase signal system with diagrams. (3+3)
b. Design a 2 phase signal for an intersection where the traffic data are given as below: (7)

Direction	From N	From S	From E	From W
Traffic	200	150	250	420
Saturated Traffic	850	750	1200	1100

Assume All Red Time as 4 seconds. Assume any other data if necessary.