Hall Ticket No | | | | | | | | | | | Question Paper Code: ACEB23

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022
Regulation: R18

TRANSPORTATION ENGINEERING

Time: 3 Hours **(CIVIL ENGINEERING)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Describe briefly about modified classification of road system in India as per the Third Road Twenty Year Development Plan, 1981 – 2001. [BL: Understand| CO: 1|Marks: 7]

   (b) Calculate NH, SH, MDR, ODR, VR as per twenty years plan (or) boundary road plan given in Table 1. Total area = 18400Km^2 developed or agricultural area = 8000Km^2 Undeveloped area = 4800 Km^2 [BL: Apply| CO: 1|Marks: 7]

Table 1

Population	<500	500 - 1000	1000 - 2000	2000 - 5000	5000 - 10000	10000 - 20000	20000 - 50000	50000 - 100000	>100000
No of Towns	200	350	750	360	150	80	25	10	5

2. (a) Explain the necessity of realignment in a highway project. Classify various obligatory points in highway alignment. [BL: Understand| CO: 1|Marks: 7]

   (b) Determine the length of different categories of roads in a state in India by the year 2001 using third road development concept, the following data given. Total area of the state = 52,105 sq.km, Total number of towns as per 1981 census =26, overall road density aimed at= 82 km per 100 sq.km area. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

3. (a) Interpret the role of pavement surface characteristics in highway geometrics design. List out the factors affecting friction between pavements and tyre of vehicles? [BL: Understand| CO: 2|Marks: 7]

   (b) On a two lane highway car A & B are moving at a speed of 40 kmph and 80 kmph. After initial hesitation period of 2 sec driver of A started overtaking operation. Distance between A & B at that time was 30 m. Acceleration of Vehicle A is 1.20m/sec^2 .Distance between B& A is 25 m. Determine the distance between two cars A & C at the instance of completion of overtaking operation also calculate the desirable length of overtaking zone [BL: Apply| CO: 2|Marks: 7]

4. (a) Categorize different types of gradients that can be provided on highway alignment and deduce the relation $e + f = v^2/2g$? [BL: Understand| CO: 2|Marks: 7]

   (b) A vertical summit curve is formed at the intersection of two gradients, +3.0 and -5.0 percent. Design the length of summit curve to provide a stopping sight distance for a design speed of 80kmph. Assume other relevant data. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

5. (a) List out the various factors cause accidents in traffic engineering and explain various engineering measures to reduce accidents? [BL: Understand| CO: 3|Marks: 7]

   (b) A vehicle moving at 40kmph speed was stopped by applying breaks and length of the skid mark was 12.2 m. if average skid resistance of the pavement is known to be 0.70. Determine the break efficiency of the test vehicle? [BL: Apply| CO: 3|Marks: 7]

6. (a) Outline the procedure for conducting spot speed studies. Illustrate with neat sketches about the classification of traffic signs [BL: Understand| CO: 4|Marks: 7]

   (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 various arms and the saturation flows for these arms are given in Table 2. Calculate the optimum cycle time and green times 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 assumed to be 2 sec. The value of amber if 2 seconds. Sketch the timing diagram for each phase.
   [BL: Apply| CO: 4|Marks: 7]

Table 2

	North	South	East	West
Design hour flow in PCU/hr	800	400	700	900
Saturation flow in PCU/hr	2400	2000	2900	2900

MODULE – IV

7. (a) Identify the various tests to be conducted on stone aggregate for road construction as per Indian standard code [BL: Understand| CO: 5|Marks: 7]

   (b) Compare water bound macadam roads with bitumen bound macadam. Explain in detail about highway material characterization in road construction as per Indian standard code.
   [BL: Understand| CO: 5|Marks: 7]

8. (a) Explain about the penetration and float tests conducted for the bitumen as per Indian standard code. [BL: Understand| CO: 5|Marks: 7]

   (b) Summarize the principles, applications and limitations of unconfined compression test as per Indian standard code. [BL: Understand| CO: 5|Marks: 7]

MODULE – V

9. (a) Enlist the factors affecting the design and performance of rigid pavements. Mention the importance of each. [BL: Understand| CO: 6|Marks: 7]

   (b) Calculate the stresses at interior, edge and corner regions of a cement concrete pavement using Westergards's stress equation. Use the following data: Wheel load P = 5200 kg, modulus of elasticity of concrete, $E = 0.3 \times 10^6 kg/cm^2$; pavement thickness h= 18cm, poisson ratio, μ= 0.15, Modulus of subgrade reaction, $k = 3.0 kg/cm^3$, radius of contact area, a = 15 cm [BL: Apply| CO: 6|Marks: 7]

10. (a) Describe flexible pavement along with a neat sketch containing cross section and various components. State the function and importance of each component of the flexible pavement. [BL: Understand| CO: 6|Marks: 7]

    (b) Design the pavement for construction of a new bypass with the following data:
    Two lane single carriageway initial traffic in the year of completion of construction: 600 CV/day (sum of both directions), traffic growth rate per annum: 7.5 percent design life: 20 years vehicle damage factor: 2.5 (standard axles per (Based on axle load survey) commercial Vehicle) design CBR of sub grade soil: 6 Percent [BL: Apply| CO: 6|Marks: 7]

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