II B. Tech I Semester Regular Examinations, March - 2021
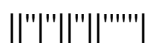**TRANSPORTATION ENGINEERING-I**
(Civil Engineering)

Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1 a) Explain the importance of the Jayakar Committee and its recommendations.   [8M]
   b) What are the various road patterns practiced? Explain with diagrams.   [7M]
OR
2 a) Define Master plan. Discuss the role of engineering Surveys in finalizing the   [8M]
        highway alignment?
   b) Discuss the Salient features of the Nagpur Road Plan?   [7M]
3 a) What are the objects of Camber? Discuss how the amount of camber to be provided   [8M]
        depends and specify the recommended ranges of camber for different types of
        payment surfaces.
   b) Define Sight Distance? Explain the factors on which stopping sight distance   [7M]
        depends? Also, explain the significance of stopping, intermediate, and overtaking
        sight distance?
OR
4 a) Explain the superelevation. Derive the expression for finding the superelevation   [8M]
        required if the design coefficient o lateral friction is 'f'. Also, calculate the needed
        friction if no superelevation is provided, given the radius of the curve is 270 m and
        design speed is 68 kmph?
   b) Explain the factors that govern the length of sag and crest curves?   [7M]
5 a) What are the different vehicular characteristics which affect the road design?   [8M]
        Discuss
   b) Enumerate the various types of intersections and the basic principles involved?   [7M]
OR
6 a) Explain origin and destination study. What are the various uses of O & D studies?   [8M]
   b) Explain grade-separated intersections, advantages, and limitations, and draw a neat   [7M]
        sketch of a full cloverleaf?
7 a) Why is it essential for a highway engineer to study the behavior of soil? What are   [8M]
        the desirable properties of subgrade soil?
   b) How do you determine the flakiness index of road aggregates? What are the   [7M]
        prescribed limits of the flakiness index for the road aggregates given by IRC?
OR
8 a) Explain the CBR test procedure for field and laboratory tests. How are the results   [8M]
        of the test obtained and interpreted?
   b) Recall various tests carried out on bitumen? Discuss the practical applications of   [7M]
        each.
9 a) Under which circumstance Flexible and Rigid pavements are adopted and bring out   [8M]
        the difference between them?
   b) Explain the critical locations of loading as regards wheel load stresses in cement   [7M]
        concrete pavement. Discuss Westergaard's concept and assumptions?
OR
10 a) Discuss the importance of gross wheel load and contact pressure in stress   [8M]
        distribution patterns in pavement design?
   b) Enumerate the various methods of flexible pavement design. Briefly, indicate the   [7M]
        basis of design in each case?

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1   a)   Write down the classification of Roads based on the Nagpur Road Plan? And explain in detail the classification of roads based on the Tertiary road system?   [8M]
    b)   Write the various factors controlling the alignment of roads and Explain Obligatory points with sketches?   [7M]

OR

2   a)   Four new Roads are to be constructed with different lengths. What is the order of priority based on the Concept of max utility?

Road	Length (Km)	No of villages with population			
		<2000	2000-5000	>5000	Industrial product
P	220	5	6	8	200
Q	280	2	4	7	270
R	450	10	2	3	315
S	360	6	8	1	335

[8M]
    b)   Note down the Different Road development plans in India in chronological order and explain any detail in detail?   [7M]

3   a)   Explain the "PIEV" theory and explain which factors the driver's total reaction time will depend on.   [8M]
    b)   The speeds of overtaking and overtaken vehicles are 96 kmph and 55 kmph, respectively, for a two-way traffic Road. If the acceleration of overtaking vehicle is 0.99m/sec^2,
        a)   Calculate the safe overtaking sight distance, mention O.S.D on one-way and Two-way traffic road.
        b)   Mention the minimum length of overtaking zone and with a neat sketch.   [7M]

OR

4   a)   Derive an expression for finding the extra widening required on the horizontal curve. Determine the off-tracking of a vehicle with a wheelbase of 7.0 m while negotiating a horizontal curve of the radius of 160 m.   [8M]
    b)   Calculate the length of transition curve and shift of two-lane National Highway using the following data: Design speed = 96 kmph; The radius of curve = 260 m, Allowable rate of introduction of superelevation (pavement rotated about the centerline) =1 in 150   [7M]

5   a)   Discuss the various traffic studies and their importance.   [8M]
    b)   Define traffic rotary? Calculate the rotary capacity of given flowing data; the entry and exit width at the rotary is 10 m. The traffic approaching the intersection from four sides with weaving traffic is 2260, and total traffic is 2885?   [7M]

OR

6   a)   Explain speed, spot speed, running speed, journey speed, space mean speed, and time-mean speed. Express the relationship between the Space mean speed and time mean speed?   [8M]
    b)   Explain the various types of traffic signals and their functions. How are the signal timings decided?   [7M]

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7   a)   Explain the significance of subgrade soil? Write down the desirable properties of soil as a highway material?   [8M]

     b)   Explain the steps involved in the Marshall Method of design.   [7M]

OR

8   a)   Explain the desirable properties of aggregate to be used in various types of pavement construction?   [8M]

     b)   Define tar, bitumen, cutback, and emulsion, and discuss the desirable properties of bitumen?   [7M]

9   a)   Draw a neat sketch of flexible pavement cross-section and show the component parts. Enumerate the functions and importance of each component of the pavement?   [8M]

     b)   Discuss the critical combination of stresses due to wheel load and temperature effects?   [7M]

OR

10 a)   Explain ESWL and the concept in the determination of the equivalent wheel load?   [8M]

     b)   Explain with neat sketches various types of flexible pavement failures?   [7M]

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1	a)	Discuss how social and economic development is linked to systematic and scientific road development.	[8M]
	b)	Explain the salient features of the Nagpur Road Development plan and Bombay Road Development Plan. What are the main differences between the two plans? Discuss.	[7M]

OR

2	a)	Define highway alignment? List the requirements of good highway alignment? What factors influence the final alignment of a highway? Discuss with neat sketches.	[8M]
	b)	Discuss the Salient features of the Nagpur Road Plan?	[7M]
3	a)	With the help of a neat diagram indicating the various geometric elements of a traffic rotary, explain the design elements of a rotary intersection	[8M]
	b)	Derive an expression for overtaking sight distance on a two-lane two-way road. Support your derivation with a neat sketch showing the overtaking operation and various distance components involved	[7M]

OR

4	a)	Define Superelevation. Derive an expression for computing the superelevation rate for a road section on a horizontal curve, analyzing the various forces acting on the vehicle moving on the curve.	[8M]
	b)	Explain the factors that govern the length of sag and crest curves?	[7M]
5	a)	Define Traffic Volume, Speed, and Density. What are the units in which each of these parameters is measured? Explain. Explain their interrelationship	[8M]
	b)	Enumerate the various types of intersections and the basic principles involved?	[7M]

OR

6	a)	Explain the manual method of conducting traffic volume studies	[8M]
	b)	Discuss the need for grade-separated intersections, advantages, and limitations.	[7M]
7	a)	Why is it essential for a highway engineer to study the behavior of soil? What are the desirable properties of subgrade soil?	[8M]
	b)	Discuss the importance of the Aggregate Impact value test? Mention theee various limits for bases and subbases as per MoRTH, 2014 Specifications.	[7M]

OR

8	a)	Explain the CBR test procedure for field and laboratory tests. How are the results of the test obtained and interpreted?	[8M]
	b)	What are the various test carried out on bitumen? Briefly mention the principle of any two tests and practical applications?	[7M]

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9 a) The rigid pavement is preferred over the flexible pavement. Justify your answer with suitable examples.   [8M]

    b) Explain the critical locations of loading as regards wheel load stresses in cement concrete pavement. Discuss Westergaard's concept and assumptions?   [7M]

OR

10 a) Discuss the importance of gross wheel load and contact pressure in stress distribution patterns in pavement design?   [8M]

    b) Enumerate the various methods of flexible pavement design. Briefly, indicate the basis of design in each case?   [7M]

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1. a) Explain the modified classification of the road system in India as per the Third Twenty Year Road Development Plan [8M]

   b) Write the various factors controlling the alignment of roads and Explain Obligatory points with sketches? [7M]

OR

2. a) There are five alternate proposals of road plans for a backward district, whose details are given below. Justify with reasons which proposal is the best assuming; [8M]

Proposal	Length, km	No. of towns & villages served with a population range					Productivity in 1000 tonnes	
		<2000	2001-5000	5001-10000	10001-20000	>20000	Agricultural	Industrial
P	520	106	145	40	22	3	150	25
Q	590	215	245	66	30	3	220	28
R	710	281	350	80	35	4	310	36
S	780	288	410	89	40	4	420	43
T	900	299	426	92	42	5	430	47
Utility units		0.6	1.0	2.0	4.0	8.0	2.0	6.0

   b) What are the different modes of Transportation? Discuss salient features of each of them [7M]

3. a) Explain the "PIEV" theory and explain which factors the total reaction time of the driver will depend on. [8M]

   b) Show with neat sketch the right of way and indicate all boundaries. Explain the reason for providing extra width on horizontal curves. [7M]

OR

4. a) The radius of a horizontal curve is 400m, the total pavement width at the curve is 7.6m and the superelevation is 0.07. Design the transition curve length for a speed of 100kmph. Assume pavement to be rotated about the inner edge. [8M]

   b) A highway of width 7.5 m radius 150 m with a 120 kmph and the length of the wheel base 7.0 m. Find the extra widening required. [7M]

5. a) Discuss the various traffic studies and their importance in highway design. [8M]

   b) Differentiate rotary and roundabout. Calculate the rotary capacity of given flowing data; the entry and exit width at the rotary is 10 m. The traffic approaching the intersection from four sides with weaving traffic is 2260, and total traffic is 2885? [7M]

OR

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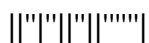
6　a)　Explain: spot speed, running speed, journey speed, space mean speed and time-mean speed. Express the relationship between the Space mean speed and time mean speed?　[8M]

　b)　At a right-angled intersection of two roads, road 1 has four lanes with a total width of 14.0 m, and road 2 has two lanes with a total width of 7.0 m. The volume of traffic approaching the intersection during design hour are 1240 and 880 pcu/hour on the two approaches of road 1 and 380 and 290 pcu/hour on the two approaches of road 2. Design a two-phase traffic signal by Webster's method.　[7M]

7　a)　List out the physical requirement of materials for subgrade and its construction process　[8M]

　b)　Define OBC. Discuss the steps involved in the Marshall Method of design and its limitations.　[7M]

OR

8　a)　Explain the desirable properties of aggregate to be used in various pavement construction types along with their specifications in various layers.　[8M]

　b)　Define: Bitumen, cutback, and emulsion, and discuss the desirable properties of bitumen for pavement construction.　[7M]

9　a)　Draw a neat sketch of flexible pavement cross-section and show the component parts. Enumerate the functions and importance of each component of the pavement?　[8M]

　b)　Discuss the critical combination of stresses due to wheel load and temperature effects?　[7M]

OR

10　a)　Explain ESWL and the concept in the determination of the equivalent wheel load?　[8M]

　b)　List out the types of pavement along with their component and functions　[7M]

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