R13

SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2016
TRANSPORTATION ENGINEERING – I
(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
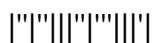3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	List the classification of roads	[4M]
	b)	What is the meaning of highway geometric design?	[3M]
	c)	How is the presentation of traffic volume data done?	[4M]
	d)	Write the formula of Group Index and explain the various terms in it	[4M]
	e)	What are the critical load stresses as per Westergaard on a rigid pavement	[3M]
	f)	On what factors does the selection of base and surface course depend upon	[4M]

PART -B

2 a) Explain about the four most important recommendations made by the Jayakar committee [8M]

  b) Write a note on the road patterns [8M]

3 a) Explain the elements of highway geometric design [10M]

  b) For a highway with design speed of 100kmph, determine the safe OSD (assume acceleration as 0.50 m/s^2, and reaction time =2.0s) [6M]

4 a) Write a note on the common methods of on-street parking? [10M]

  b) What are the functions of traffic signs? [6M]

5 a) What are the desirable properties of soil as a highway material? [10M]

  b) During aggregate crushing test on road aggregates, the weight of crushed aggregates retained on 2.36mm sieve is 400g. The original weight of aggregates is 500g. Determine the aggregate crushing value? During Los Angeles abrasion test on similar aggregates, the weight of powdered aggregates passing 1.70mm sieve is 1000g. The original weight of aggregates is 5kg. Determine the abrasion value? [6M]

6 a) Elaborate on the factors to be considered when designing pavements [10M]

  b) What is the radius of relative stiffness for a 20cm thick slab with E = 3x 10^5 kg/cm^2 and Poisson's ratio = 0.15, resting on a subgrade having modulus of 5kg/cm^3? [6M]

7 a) How is the surface condition of flexible and rigid pavements evaluated? What are the categories of overlay combinations? [10M]

  b) On what factors does the selection of the base and surface course of the pavement depend upon? [6M]

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PART –A

1	a)	List the characteristics of an ideal alignment	[4M]
	b)	What are the factors affecting friction or skid resistance	[4M]
	c)	What are the methods of collecting O&D data	[4M]
	d)	List the names of any three tests to be carried on an aggregate sample	[3M]
	e)	What type of stresses are produced in a rigid pavement due to temperature	[3M]
	f)	Differentiate between sheet asphalt and mastic asphalt	[4M]

PART -B

2	a)	Explain about the five main objectives of highway planning	[10M]
	b)	Write the salient features of Nagpur Road Plan	[6M]

3	a)	Why is it not desirable to provide a very steep cross slope on pavements	[8M]
	b)	Find the minimum sight distance to avoid head-on collision of two cars approaching at 90kmph and 60kmph. Given t=2.5s, f=0.70 and brake efficiency of 50% in either case.	[8M]

4	a)	Write a note on types of traffic signs?	[8M]
	b)	Explain about types of road markings?	[8M]

5	a)	Elaborate on the factors on which the strength characteristics of soil depend upon?	[8M]
	b)	In the Marshall method of mix design, the coarse aggregates, fine aggregates, filler and bitumen, having respective specific gravities of 2.62, 2.72, 2.70 and 1.02, are mixed in the ratio of 55, 34.6, 4.8 and 5.6 percent, respectively. The volume of one Marshall mould is 475cc and its weight is 1100g. Assuming absorption of bitumen by aggregates is zero; determine the percentage voids in mineral aggregates.	[8M]

6	a)	Write a note on the functions of various components of a pavement and their methods of evaluation	[10M]
	b)	A subgrade soil sample was tested using standard CBR apparatus and the observations are given below.	[6M]

Load (kg)	Penetration (mm)
60.5	2.5
80.5	5.0

Assuming that the load-penetration curve is convex throughout, what is the CBR value of the sample?

7	a)	Explain about the various steps for the construction of an earthen road?	[8M]
	b)	Explain about the maintenance works of bitumen surfacing?	[8M]
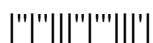
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Please provide graph sheets to the candidates
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PART –A

1 a) What are the factors affecting the highway alignment   [4M]
   b) Mention different types of kerbs   [3M]
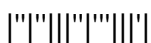   c) What are Condition Diagram and Collision Diagrams   [4M]
   d) What are the desirable properties of bitumen   [4M]
   e) Write the formula to determine the cumulative standard axles for design of a flexible   [3M]
       pavement, and explain the terms in the formula
   f) What are the two basic reasons to which failure of a flexible pavement subgrade may   [4M]
       be attributed to
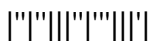
PART -B

2 a) The Nagpur Road Plan classified roads in India based on location and function. Into   [6M]
       how many categories were the road classified and elaborate on any two categories.
   b) Explain about the basic requirements of an ideal alignment   [10M]

3 a) Write a note on the important surface characteristics of the pavement.   [10M]
   b) Calculate the SSD for V =50kmph for (**a**) two-way traffic on a two lane road   [6M]
       (**b**) Two-way traffic on single lane road. Assume reaction time =2s.

4 a) What are the advantages of traffic signals?   [6M]
   b) A pre-timed four phase signal has normal flow rates for the first three phases as 200,   [10M]
       187 and 210 veh/hr with saturation flow rates of 1800 veh/hr/lane for all phases. The
       lost time is given as 4 seconds for each phase. If the cycle length is 60 seconds.
       Using Webster's method, determine the effective green time of 4th phase?

5 a) Briefly explain about the laboratory CBR test   [10M]
   b) The load penetration data from a California Bearing Ratio (CBR) test is provided in   [6M]
       the following table. Indicate whether any correction is required for the calculated
       CBR value. Find the CBR value of the soil from the data provided.

Penetration (mm)	0	0.5	1.0	1.5	2.0	2.5
Load in (kgf)	0	4	13	29	40	50
Penetration (mm)	3.0	4.0	5.0	7.5	10	12.5
Load in (kgf)	58	70	78	93	103	112

Area of the plunger is 19.60cm^2.

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6   a)   Elaborate on the various approaches of flexible pavement design   [10M]

    b)   Calculate the spacing between contraction joints for a two lane 250mm thick   [6M]
concrete road having 3.5m wide slab. Unit weight of concrete = 24kN/m^3. Ultimate
stress in tension = 0.16MPa. Coefficients of friction at interface = 1.5, and the factor
of safety = 2. Also calculate the spacing between expansion joints, if the increase in
temperature is 20^0C, the expansion joint gap is 24mm and the thermal coefficient =
10×10^{-6} per ^{0}C.

7   a)   Explain the construction procedure of an water bound macadam road   [8M]

    b)   Explain about typical flexible pavement failures?   [8M]

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3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) Write the important highlights of highway development in India. [4M]
  b) Define off-tracking and write the formula for extra widening and write the meanings [3M]
     of the terms in the formula.
  c) List the types of Intersections. [3M]
  d) Define the terms modulus of Subgrade Reaction and California Bearing Ratio . [4M]
  e) What are the functions of the various layers of a flexible pavement? [4M]
  f) The various methods of pavement evaluation are broadly classified into two groups. [4M]
     What are they?

PART -B

2 a) Planning surveys consist of four studies. What are they? Explain about any one study [6M]
  b) List the various factors which control the highway alignment. Explain about any two [10M]
     of them

3 a) What are the reasons for providing a median? What are the types of traffic separators [8M]
  b) A vehicle moving at 65kmph on an ascending gradient of a highway has to come to [8M]
     stop position to avoid collision with a stationary object. The ratio of lag to brake
     distance is 6:5. Considering total reaction time of the driver as 2.5 seconds and the
     coefficient of longitudinal friction as 0.35, determine the value of ascending
     gradient.

4 a) With neat diagrams explain about condition and collision diagrams? [8M]
  b) A roundabout is provided with an average entry width of 8.4m, width of weaving [8M]
     section is 14m, and length of the weaving section between channelizing islands as
     35m. the crossing traffic and total traffic on the weaving section are 1000 PCU per
     hour and 2000 PCU per hour respectively. Determine the practical capacity of the
     roundabout?

5 a) Briefly explain the Los Angeles abrasion test procedure [10M]
  b) In the Marshall method of mix design, the coarse aggregates, fine aggregates, filler [6M]
     and bitumen, having respective specific gravities of 2.62, 2.72, 2.70 and 1.02, are
     mixed in the ratio of 55, 34.6, 4.8 and 5.6 percent, respectively. What is the
     theoretical specific gravity of the mix

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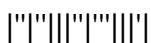
6 a) Write a note on radius of relative stiffness, equivalent radius of resisting section and   [10M]
       Westergaard's concept of temperature stresses in concrete pavement.
    b) For a 25cm thick cement concrete pavement, analysis of stresses gives the following   [6M]
       values :

       Wheel load stress due to comer loading = 30 kg/cm^2
       Wheel load stress due to edge loading = 32 kg/cm^2
       Warping stress at corner region during summer = 9 kg/cm^2
       Warping stress at corner region during winter = 7 kg/cm^2
       Warping stress at edge region during summer = 8 kg/cm^2
       Warping stress at edge region during winter = 6 kg/cm^2
       Frictional stress during summer = 5 kg/cm^2
       Frictional stress during winter = 4 kg/cm^2
       What is the most critical stress value for this pavement?

7 a) Write notes on prime coat, tack coat, seal coat and the main functions of a seal coat?   [8M]
    b) What are the general causes of pavement failures?   [8M]

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