

Code : 011619

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B.Tech 6th Semester Exam., 2016

TRANSPORTATION ENGINEERING—I

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the most suitable option (any seven) :

2×7=14

(a) The road connecting capitals of State is known as

- (i) NH
- (ii) SH
- (iii) provincial highway
- (iv) MDR

(b) The portion of the road surface which is used by the vehicular traffic is known as

- (i) carriageway
- (ii) shoulder
- (iii) expressway
- (iv) All of the above

(c) As per IRC, the camber on cement concrete road should be

- (i) 1 in 45 to 60
- (ii) 1 in 20 to 24
- (iii) 1 in 12 to 16
- (iv) 1 in 60 to 72

(d) For the relationship $u=55-0.44 k$, where u is the speed in kmph and k is the density in vpk, what will be the maximum flow in vph?

- (i) 625
- (ii) 1250
- (iii) 1718
- (iv) 125

(e) Ratio of width of the car parking area required at kerb for 30° parking relative to 60° parking is approximately

- (i) 0.7
- (ii) 0.5
- (iii) 0.8
- (iv) 2.0

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- (f) As per IRC, the minimum length of transition curve for a mountainous terrian road with radius of curveture 100 m and design speed of vehicle 100 kmph is
- (i) 270 m
 - (ii) 200 m
 - (iii) 170 m
 - (iv) 100 m
- (g) In the design of highways, expansion and contraction joints should respectively be provided at
- (i) 50 m and 32 m
 - (ii) 50 m and 10 m
 - (iii) 25 m and 10 m
 - (iv) 25 m and 32 m
- (h) The result of ring and ball softening point test on asphalts is given in terms of
- (i) viscosity
 - (ii) time
 - (iii) temperature
 - (iv) flow

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- (i) Excessive deformation in foundation course of a flexible pavement is known as
- (i) base course failure
 - (ii) wearing course failure
 - (iii) subgrade failure
 - (iv) pavement failure
- (j) Reinforcement in cement concrete pavement is kept
- (i) 5 cm high from the bottom level
 - (ii) 5 cm below from the top level
 - (iii) in the centre of the slab
 - (iv) in the bottom of the slab

2. (a) What is the importance of Nagpur Road Plan in highway planning of our country?

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(b) Briefly outline the main features of various road patterns commonly in use. Explain with sketches the star and grid patterns.

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3. (a) Differentiate between camber and super-elevations. 4

(b) Find the length of transition curve and extra width of pavement required on a horizontal curve of radius 300 m of a two-lane highway passing through rolling terrain for a design speed of 80 kmph. Assume all other data as per IRC recommendations. 10

(a) Explain PIEV theory. What are the factors on which the stopping sight distance depends? 7

(b) On a two-way traffic road, the speed of overtaking and overtaken vehicles are 65 kmph to 40 kmph respectively. If the average acceleration of overtaking vehicle is 0.92 m/sec^2 , determine
(i) safe overtaking sight distance and
(ii) the minimum length of overtaking zone. 7

5. (a) Discuss spot speed, running speed, space-mean speed, time-mean speed and average speed. How are spot-speed studies carried out? 8

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(b) A helicopter pilot recorded the travel time of five vehicles on a 3.2 km segment of a highway. Estimate the time-mean speed and space-mean speed of the vehicles : 6

Vehicle	Travel Time (sec)
1	161
2	173
3	145
4	159
5	182

6. (a) Differentiate between flexible and rigid pavements. 5

(b) Calculate the stresses at interior, edge and corner regions of a cement concrete pavement using Westergaard's stress equations using the following data : 9

Wheel load = 4100 kg
 E of concrete = $3.3 \times 10^5 \text{ kg/cm}^2$
 Pavement thickness = 18 cm
 Poisson's ratio = 0.15
 Modulus of subgrade reaction
 $k = 25 \text{ kg/cm}^3$
 Radius of contact area = 12 cm

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7. (a) Discuss the advantages and disadvantages of traffic rotaries. 6
- (b) Explain the following terms : 8
ESWL; Tyre inflation pressure;
CBR; Dowel bar
8. (a) What are the functions of prime coat, tack coat and seal coat in bituminous construction? 7
- (b) Enumerate the steps for preparation of WBM layer. Explain all steps in brief. 7
9. (a) What are the various types of failure in flexible pavement? Explain the causes. 7
- (b) Indicate how the filter material is designed for use in subsurface drainage system. 7
