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Code : 011619

B.Tech 6th Semester Exam., 2015

TRANSPORTATION ENGINEERING—I

Time : 3 hours

Full Marks : 70

Instructions :

- (i) All questions carry equal marks.
- (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) :

- (a) The sequence of four stages of survey in a highway alignment is
  - (i) reconnaissance (R), map study (MS), preliminary survey (PS) and detailed survey (DS)
  - ☒ (ii) MS, PS, R, DS
  - (iii) MS, R, PS, DS
  - ☒ (iv) PS, MS, R, DS
- (b) The stopping sight distance depends upon
  - (i) total reaction time of driver
  - (ii) speed of vehicle
  - (iii) efficiency of brakes
  - ☒ (iv) All of the above

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- (c) Camber in the road is provided for
  - ☒ (i) effective drainage
  - (ii) counteracting the centrifugal force
  - (iii) having proper sight distance
  - (iv) None of the above
- (d) For the design of superelevation for mixed traffic condition, the speed is reduced by
  - (i) 15%
  - (ii) 20%
  - (iii) 25%
  - (iv) 75%
- (e) The value of ruling gradient in plain as per IRC recommendation is
  - (i) 1 in 12
  - ☒ (ii) 1 in 15
  - (iii) 1 in 20
  - (iv) 1 in 30
- (f) The maximum width of a vehicle as recommended by IRC is
  - (i) 1.85 m
  - ☒ (ii) 2.44 m
  - (iii) 3.81 m
  - (iv) 4.72 m

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- (g) The traffic volume is equal to  
 (i) traffic density  $\times$  traffic speed  
 (ii) traffic density/speed  
 (iii) traffic speed/traffic density  
 (iv) None of the above
- (h) The background colour of the informatory signboard is  
 (i) red  
 (ii) yellow  
 (iii) green  
 (iv) white
- (i) Penetration test on bitumen is used for determining its  
 (i) grade point  
 (ii) viscosity point  
 (iii) ductility point  
 (iv) softening point
- (j) Which of the following causes ravelling in bituminous pavement?  
 (i) Use of soft bitumen  
 (ii) Excessive bitumen content  
 (iii) Low bitumen content  
 (iv) Use of open-graded aggregate

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2. (a) What are the various modes of transformation? Explain the specific functions of each of them.  
 (b) The area of a certain district in India is  $13400 \text{ km}^2$  and there are 12 towns as per 1981 Census. Determine the lengths of different categories of roads to be provided in the district by the year 2001.
3. (a) Derive an expression for finding the stopping sight distance at level and at grades.  
 (b) Discuss PIEV theory. Explain total reaction time of driver and the factors on which it depends.
4. (a) Explain the methods of introducing extra widening of pavement on horizontal curves.  
 (b) There is a horizontal highway curve of radius 400 m and length 200 m on this highway. Compute the setback distances required from the centreline on the inner side of the curve so as to provide for—  
 (i) stopping sight distance of 90 m;  
 (ii) safe overtaking sight distance of 300 m.
- The distance between the centrelines of the road and the inner lane is 1.9 m.
5. (a) What do you mean by grade compensation on curves?

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- (b) Design a valley curve at the junction of a downward gradient of 1 in 30 and a level stretch from headlight consideration. The stopping sight distance is 180 m. Treating the curves as a square parabola, set out the curve.
6. (a) What are the objectives of channelization? What are the features of channelizing island?
- (b) What are the basic forms of at-grade intersection? Give sketches showing the details of each type.
7. (a) What are the various factors affecting the design of highway pavement?
- (118) (b) Calculate the deflection at the surface of a pavement due to a wheel load of 40 kN and a tyre pressure of  $0.5 \text{ MN/m}^2$ . The value of modulus of elasticity of the pavement and subgrade may be assumed to be uniformly equal to  $20 \text{ MN/m}^2$ .
8. (a) Give various grades of bitumen cutback and emulsions, and indicate the appropriate conditions for which they can be used.
- (b) What is surface dressing? What are the functions of surface dressing?

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9. Write short notes on any *four* of the following :
- (a) WBM
- (b) Design speed
- (c) Pavement unevenness
- (d) Level of service
- (e) Traffic islands

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