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B.Tech 6th Semester Examination, 2017

Transportation Engg.-I

Time : 3 hours

Full Marks : 70

Instructions :

- (i) There are Nine Questions in this Paper.
- (ii) Attempt Five questions in all.
- (iii) Question No. 1 is Compulsory.
- (iv) The marks are indicated in the right-hand margin.

1. Fill in the blanks of any seven of the following:  $2 \times 7 = 14$

- (i) A transition curve has a radius which decreases from \_\_\_\_\_ at the tangent point to a designed radius.
- (ii) A width of \_\_\_\_\_ is considered desirable for a road having single lane for vehicles of maximum width 2.44 m.
- (iii) The rigid characteristics are associated with \_\_\_\_\_ action.
- (iv) The ratio of contact pressure to tyre pressure is defined a \_\_\_\_\_ factor.
- (v) The property of the stones to withstand the adverse actions of weather may be called \_\_\_\_\_.
- (vi) When the bitumen contains some inert materials it is sometimes called \_\_\_\_\_.

P.T.O.

(vii) Keeping all these problems in view, bituminous stabilization seems to be a suitable solution for \_\_\_\_\_.

(viii) The distance travelled by the vehicle during the total reaction time known as \_\_\_\_\_ distance.

(ix) The spacing between contraction joints for 3.5 m slab width having thickness of 10 cm for plain cement concrete is \_\_\_\_\_.

(x) A plate bearing test was carried out on sub grade using a 76 cm diameter rigid plate. A deflection of 1.25 mm was caused by a pressure of  $0.84 \text{ kg/cm}^2$ . The modulus of sub grade reaction is \_\_\_\_\_  $\text{kg/cm}^3$ .

2. (a) Why is widening of pavement necessary at horizontal curve? Explain the method of calculating widening and derive the formula. 7

(b) Determine the absolute minimum radius and ruling minimum radius for minimum value of super elevation of horizontal curve for a design speed of 50 kmph. 7

3. (a) What do you understand by right distance? How does it affect the design and construction of highway? 7

(b) Calculate the minimum non-passing sight distance on a highway at a descending gradient of 6%. Given the following data: 7

Code : 011619

2

Design speed = 80 kmph

Reaction time of driver = 2.5 secs

coefficient of friction between tyre and road surface = 0.4.

- 7
4. (a) What points will you bear in mind while deciding about the alignment of a new road? 7
- (b) What are the principles to be considered for an ideal highway alignment? Discuss in brief. 7
5. (a) Name the usual tests employed for evaluating the road aggregates. What test values are generally considered suitable for road stones to behave as good construction materials? 8
- (b) What are the objects of carrying out penetration, ductility and softening point tests on bitumen? 6
6. (a) What is understood by the following terms: 8
- (i) AADT (ii) 85 percentile speed
- (iii) Basic capacity (iv) PCU
- (b) The average normal flow of traffic on cross roads A and B during design period are 400 and 250 PCU per hour. the saturation flow values on these roads are estimated as 1250 and 1000 PCU per hour respectively. The all-red time required for pedestrian crossing is 12 secs. Design two phase traffic signal by Webster's method.

Code : 011619

3

P.T.O

7. (a) Discuss the functions of pavement layers, and draw the sketch of Flexible pavement layers in proper sequence. 6

- (b) Design a tie-bar system for a cement concrete pavement, given. 8

Slab thickness = 20 mm, slab width = 3.35 m

Number of lanes to be tied = 2

Coefficient of friction between slab & subgrade = 1.5,

weight of slab = 480 kg/m<sup>2</sup>.

Allowable working stress in steel = 1400 kg/cm<sup>2</sup>

Maximum permissible bond stress for plain bars

= 17.5 kg/cm<sup>2</sup> & deformed bars = 24 kg/cm<sup>2</sup>.

8. (a) Differentiate between WBM and WMM. 6
- (b) What do you understand by penetration macadam? What are the various materials used and what should be their requirements? Describe the methods of construction of a penetration macadam road. 8
9. (a) Discuss the scope of soil stabilization in road construction. 6
- (b) Explain with sketches how the subsurface drainage system is provided to lower the W.T. and control seepage flow. 8

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4

Code " 011619