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B. TECH.
(SEM V) THEORY EXAMINATION 2017-18
TRANSPORTATION ENGINEERING-I

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If any missing data required, then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

- a. Draw typical cross section of Macadam's construction.
- b. Write short note on IRC.
- c. Define Kerbs and shoulders.
- d. What do you understand by setback distance.
- e. Explain passenger car unit (PCU).
- f. Write any two advantage and disadvantage of traffic signals.
- g. What is kerb marking and object marking?
- h. Explain Flash and fire point in bitumen.
- i. Discuss Expansion and Contraction joint.
- j. Define Equivalent single wheel load (ESWL).

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

- a. Calculate the length of transition curve and the shift using the following data;
Design speed = 65 kmph
Radius of circular curve = 220 m
Allowable rate of introduction of superelevation (pavement rotated about the centre line) = 1 in 150
Pavement width including extra widening = 7.5 m
- b. What are the various surveys to be carried out before planning a highway system for a given area? Explain briefly.
- c. Calculate the stresses at interior, edge and corner of a cement concrete pavement by Westergaard's stress equations :
Modulus of elasticity of concrete = $3.0 \times 10^5 \text{ kg/cm}^2$ Poisson ratio for concrete = 0.15 Thickness of concrete pavement = 18 cm Modulus of subgrade reaction = 8.5 kg/cm^2 Wheel load = 5100 kg Radius of loaded area = 15 cm modulus of subgrade reaction = 6.0 kg/cm^3 radius of contact area = 15 cm.
- d. Briefly outline the main features of various road patterns commonly in use.
- e. An ascending gradient of 1 in 50 meets a descending gradient of 1 in 80. Determine length of summit curve to provide (a) ISD (b) OSD, for design speed of 80 kmph. Assume all other data.

SECTION C

- 3. Attempt any *one* part of the following: 10 x 1 = 10**
- (a) Briefly discuss the historical development of road construction. What are salient features of early roman roads? How do these differ from the present day road construction?
 - (b) Write a short notes on:
 - (i) Central road fund
 - (ii) Nagpur road plan
 - (iii) Star and Grid pattern
 - (iv) Jayakar Committee
- 4. Attempt any *one* part of the following: 10 x 1 = 10**
- (a) Explain the factors based on which the length of valley curve is designed. Calculate the length of transition curve for a design speed of 80 kmph at horizontal curve of radius 300 m in rural area. Assume suitable data.
 - (b) Derive an expression for calculating the overtaking sight distance on a highway. Calculate the stopping sight distance for design speed of 100 kmph. Take the total reaction time 2.5 seconds and coefficient of friction = 0.35.
- 5. Attempt any *one* part of the following: 10 x 1 = 10**
- (a) Explain the following terms :
 - (i) Traffic Volume
 - (ii) Traffic Density
 - (iii) Space Mean Speed
 - (iv) Passenger Car Units
 - (b) With neat sketches show various types of traffic signs and signals, classifying them in proper groups.
- 6. Attempt any *one* part of the following: 10 x 1 = 10**
- (a) Explain the CBR method of pavement design. How is this method useful to determine thickness of component layers.
 - (b) List different types of cutbacks. When are these used ? Discuss in brief the tests carried out on cutback bitumen ?
- 7. Attempt any *one* part of the following: 10 x 1 = 10**
- (a) Write short notes on :
 - (i) Seal coat
 - (ii) Sheet asphalt
 - (iii) Mastic asphalt
 - (b) Discuss the specification of course aggregate and binding materials required in WBM construction. Further explain how the following steps in WBM Construction are carried out:
 - (i) Spreading of course aggregates
 - (ii) Application of binding material