Total No. of printed pages = 3

CT-505/TE/5th Sem/2014/N

TRANSPORTATION ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What are the 3 Es of traffic engineering ? Explain briefly the various factors which affect the road user characteristic. 7

   (b) Differentiate between rigid pavement and flexible pavement. 7

2. (a) Explain the use of the different categories of road signs and sketch a typical sign of each category. 10

   (b) Draw a neat sketch of ordinary crossing and double crossing. 4

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3. (a) Define permanent way and discuss briefly the main requirement of an ideal permanent way. 4

(b) Calculate the stresses at interior, edge and corner region of a cement concrete pavement using Westergaard's stress equation. Given data are wheel load = 5100 kg, E = 3×10^5 kg/cm^2, pavement thickness = 18 cm. Poisson's ratio = 0.15, modulus of subgrade reaction K = 6.0 kg/cm^3, radius of contact area = 15 cm. 10

4. (a) Differentiate between : $3\times3=9$

(i) Expansion and contraction joints

(ii) Dowel bars and tie bars

(iii) Warping stresses and frictional stresses.

(b) What are the significance of origin and destination studies ? 5

5. (a) Explain the construction procedure of water bound macadam road (WBM). 6

(b) Discuss way side station, junction and terminals. 8

6. (a) What are the various tests carried out on bitumen ? Briefly mention the principle and uses of each test. 8

(b) State the significance of subgrade soil as a highway material and also the desirable properties of subgrade soil. 6

7. (a) The gap of expansion joint in a cement concrete pavement is 2 cm. If the laying temperature is 14°C and the maximum slab temperature in summer is 44°C, calculate the spacing between expansion joint. Assume coefficient of thermal expansion of concrete as 10×10^{-6}. 7

(b) Compute the radius of relative stiffness of 15 cm thick cement concrete slab from the following data :

E = 2,10,000 kg/cm^2, Poisson's ratio for concrete = 0.15, modulus of subgrade reaction = 7.5 kg/cm^3. 7