4. Attempt any **two** parts of the following : **(6×2=12)**

(a) What are the problems in the construction of high embankments over weak foundation soils ? How are the various problems dealt with ? Briefly list the method of construction of gravel roads.

(b) Specify the materials required for construction of WBM roads. What are the uses and limitations of this type of road ? Also write down the construction steps for WBM road.

(c) What are the advantages and drawbacks of cement concrete roads ? Discuss the uses and limitations of reinforced cement concrete and prestressed concrete pavements for highways.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2131 Roll No.

B. Tech.

(SEM. V) THEORY EXAMINATION 2011-12

TRANSPORTATION ENGINEERING—I

Time : 2 Hours *Total Marks : 50*

Note :– Attempt **all** the questions.

1. Attempt any **four** parts of the following : **(3.5×4=14)**

(a) What are the characteristics of road transport in comparison with other systems ?

(b) Show the typical cross section of Macadam's construction. What are the modifications made in this method with respect to the older methods ?

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

(d) Enumerate the factors governing the width of carriage way. State the IRC specifications for width of carriage way for various classes of roads.

(e) A vertical summit curve is formed at the intersection of two gradients, *+3.0* and *–5.0%*. Design the length of summit curve to provide a stopping sight distance for a design speed of *80 kmph*. Assume any other data suitably.

(f) A two lane road with design speed *80 kmph* has horizontal curve of radius *480 m*. Design the rate of super elevation for mixed traffic. By how much should be the outer edges of the pavement are raised with respect to the centre line, if the pavement is rotated with respect to the centre line and the width of the pavement at the horizontal curve is *7.5 m*.

2. Attempt any **two** parts of the following : **(6×2=12)**

(a) What are the objects and uses of traffic volume studies ? How will you present the data collected during the traffic volume studies ? A vehicle was stopped in *1.4 second* by fully jamming the brakes and the skid marks measured *7.0 m*. Determine the average skid resistance.

(b) What are the advantages and disadvantages of traffic signals ? The *15 minute* traffic counts on cross roads *1* and *2* during peak hour are observed as *178* and *142* vehicles per lane respectively approaching the intersection in the direction of heavier traffic flow. If the amber times required are *3* and *2* seconds respectively for two roads based on approach speeds, design the signal timings by trial cycle method. Assume average time headway of *2.5 seconds* during green phase.

(c) Explain briefly the various design factors that are to be considered in rotary intersection design. Also draw a neat sketch of a full cloverleaf and show the movement of traffic.

3. Attempt any **two** parts of the following : **(6×2=12)**

(a) Explain the CBR method of pavement design. How is this method useful to determine the thickness of component layers ? Discuss the advantages and limitations of CBR method of design.

(b) What are the considerations for design of rigid pavements ? Estimate the thickness of cement concrete pavement using the method suggested by IRC : Modulus of elasticity of concrete = 3×10^5 *kg/cm²*, modulus of rupture of concrete = *40 kg/cm²*, Poison's ratio of concrete = *0.15*, modulus of subgrade reaction = *6 kg/cm³*, wheel load = *5100 kg* and radius of contact area = *15 cm*.

(c) Discuss Westergaard's concept of temperature stresses in concrete pavements. Calculate the warping stresses at interior, edge and corner for a concrete pavement of thickness *20 cm* with transverse joints at *4.5 m* spacing. The width of the slab is *3.5 m*. Modulus of elasticity of concrete = 3×10^5 *kg/cm²*, Poison's ratio of concrete = *0.15*, modulus of subgrade reaction = 5 kg/cm³. Temperature differential is *0.9° C per cm*. Assume thermal coefficient for concrete as 10×10^{-6} *per °C*.