Fifth Semester B.E. Degree Examination, June/July 2016
Transportation Engineering – I

Time: 3 hrs.

Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting at least TWO questions from each part.*
2. *Use of tables and charts extracted from IRC 37-2001 & IRC 58-2002 is permitted.*

PART – A

1   a. Explain the role of transportation in the development of the country. (06 Marks)
     b. What are the significant recommendations of Jayakar committee? How are they implemented? (06 Marks)
     c. Explain the objectives of, (i) CRRI   (ii) IRC   (iii) HRB   (iv) CRF. (08 Marks)

2   a. Explain (i) Saturation system   (ii) Road patterns (06 Marks)
     b. 3 new roads P, Q, R are to be completed in a district during a five year plan period. Using the data given below work out the order of priority for phasing the plan program by the principle of maximum utility per unit length. Adopt utility unit of 0.5, 1.0, 2.0 for population ranges & 1.0 for 1000t of agricultural products or 100t of industrial products respectively. (06 Marks)

Road	Length Km	No. of villages served population			Productivity 1000 times	
		< 2000	2000-5000	> 5000	Agricultural	Industrial
P	15	10	8	3	15	1.2
Q	12	16	3	1	11	0.0
R	18	20	10	2	20	0.8

     c. What is the necessity of realignment? List the steps in the realignment. (08 Marks)

3   a. Explain the various elements of road margin. (06 Marks)
     b. The design speed of a road is 65 kmph, the coefficient of friction is 0.36 and reaction time of driver is 2.5 sec. Calculate the values of, (i) HSD, (ii) ISD required for the road. (06 Marks)
     c. Calculate the super elevation to be provided for a horizontal curve with a radius of 400 m for a design speed of 100 kmph in plain terrain comment on the results. What is the coefficient of lateral friction mobilized if super elevation is restricted to 0.07? (08 Marks)

4   a. Explain the necessity of providing transition curve and also define transition curve. (06 Marks)
     b. The speeds of overtaking and overtaken vehicles on a 2 way traffic road are 90 kmph and 60 kmph respectively. The acceleration of overtaking vehicle is 0.95 m/sec^2.
        (i)   Calculate safe overtaking sight distance.
        (ii) Mention the minimum length of overtaking zone.
        (iii) Draw a neat sketch of the overtaking zone. Show the position of sign posts. (06 Marks)
     c. A valley curve is formed by a descending grade of 1 in 25 meeting an ascending grade of 1 in 30. Design the length of valley curve to fulfill both comfort condition and head light sight distance requirements for a design speed of 80 kmph. Assume allowable rate of change of centrifugal acceleration C = 0.6 m/sec^2. (08 Marks)

PART – B

5   a.   List and explain the desirable properties of subgrade soil.   (06 Marks)
    b.   List the desirable properties of bitumen and tests to be conducted to bitumen.   (06 Marks)
    c.   Explain with a neat sketch how the plate load test is conducted to determine the modulus of
         subgrade reaction of soil.   (08 Marks)

6   a.   Explain the significance of ESWL in pave design.   (04 Marks)
    b.   Design the flexible pavement for construction of new highway with the following data:
         Number of commercial vehicles as per last count = 1000 CV.
         Period of construction = 3 yrs.
         Annual traffic growth rate = 8%
         Design CBR of subgrade soil = 10%
         Category of road NH, 2 lane single carriage way.
         Design life 15 yrs.   (08 Marks)
    c.   Design the pavement slab thickness by IRC method using the following data:
         Modulus of Subgrade reaction = 8 kg/cm^3
         Design wheel load (P) = 5100 kg
         Present traffic intensity = 1000 cvd
         Radius of contact area = 15 cm
         Highway is South Tamil Nadu t = 17.6   (08 Marks)

7   a.   Differentiate between seal coat and prime coat.   (04 Marks)
    b.   Explain the construction steps for cement concrete pavement slab.   (08 Marks)
    c.   The maximum quantity of water expected in one of the open longitudinal drains on clayey
         soil is 0.9 m^3/sec. Design the cross section and longitudinal slope of trapezoidal drain
         assuming the bottom width of trapezoidal section to be 1.0 m and cross slope to be 1.0
         vertical to 1.5 horizontal. The allowable velocity of flow in the drain is 1.2 m/sec and
         Manning's roughness coefficient is 0.02.   (08 Marks)

8   a.   Write a note on types of failures in flexible pavement.   (06 Marks)
    b.   Write a note on benefit cost ratio method BOOT concept.   (06 Marks)
    c.   Compare the annual costs of 2 types of pave structures,
         (i) WBM with thin Bituminous surface at total cost of ₹ 2.2 lakhs per km, life of 5 years,
              interest at 10%, salvage value of ₹ 0.9 lakhs after 5 years, annual average maintenance
              cost of 0.35 lakhs per km and
         (ii) Bituminous Macadam base and bituminous concrete surface total cost of ₹ 4.2 lakhs, life
              of 15 years, interest at 8%, Salvage value of 2.0 lakhs at the end of 15 years, annual
              average maintenance cost of ₹ 0.25 lakhs per km.   (08 Marks)

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