Time: 3 Hours. **Full Marks: 70**

Use separate answer script for each half
Assume data reasonably if required

FIRST HALF

Attempt Q.No.1 and any TWO from the rest

1. Write short notes on (Any three) [3x5=15]

    a) Coning of wheels and its advantages and disadvantages

    b) Pandrol clip for concrete sleepers and triple elastic fastening

    c) Merits and demerits of wooden sleepers over the concrete sleepers

    d) Semaphore signals

    e) Function of slide chairs, stretcher bars and gauge tie plate in a turnout.

2. a) Explain the advantages and disadvantages flat-footed rail over the double headed rail.

    b) Determine the optimum thickness of the stone ballast require bellow sleepers of density M+7 on a BG track.

    c) What are the different types of sleepers used in the track on Indian Railways? Draw a neat sketch of the prestressed concrete sleeper used on Indian Railways for broad gauge tracks by showing details of the location of wires and the seating arrangements. [3+3+4]

3. a) Describe the detailed procedure for designing a turnout for calculating the (i) curve lead, (ii) switch lead, (iii) heel divergence, (iv) lead of crossing and (v) radius of curvature by Coles method.

    b) Explain briefly a scissors crossover showing different rail pieces and gaps distinctly [7+3]

4. a) Derive the expression for designing the dowel bars of rigid pavement.

    b) Calculate the interior and edge stresses due to temperature in the concrete road slab with the following data:
    Lane width = 3.5 m
    Construction joint spacing = 4.5 m
    Thickness of slab= 20 cm
    Temperature differential= 18.5°C
    Coefficient of thermal expansion of concrete= 9×10^{-6} mm/mm/°C
    Modulus of elasticity of concrete= 27.6 GPa
    Modulus of subgrade reaction= 8 kg/cm^2

L/ℓ or B/ℓ	Value of 'C' (Bradbury Co-eff.)
3	0.175
4	0.440
5	0.720
6	0.920
7	1.030

[4+6]

SECOND HALF

5   Write short notes on <u>any three</u> from the followings   [3 X 5 = 15]
   a) Factors affecting trip generation in travel demand modeling.
   b) Influencing factors for modal choice.
   c) Factors affecting LOS of uninterrupted flow facility
   d) Fundamental speed-flow-density relationship.
   e) Characteristics of air transportation.
   f) Components of the airport system for a large airport.

6   a) Define basic runway length? State how the width of taxiway be designed for different aerodrome code letter.
                                                                                     [2+2]

   b) Compute the occupancy time and radius of an exit taxiway for an aircraft on the runway using the following information. Assume other data suitably as required.

Speed –over-the threshold	= 140 knot
Touchdown speed	= 110 knot
Exit speed of aircraft	= 40 knot
Average rate of deceleration in air	= 0.75 m/s^2
Average rate of deceleration in ground	= 1.2 m/s^2

                                                                                     [6]

7   a) What is head wind and cross wind? Define Optimum location of an exit taxiway

   b) The runway is to be constructed at an elevation of 390m above MSL with basic runway length considered as 1300m. The difference in elevation between highest and lowest point is 4.3m. Monthly mean of maximum daily temperature for hottest month is 48^{0}C and monthly mean of the average daily temperature for the hottest month is 31^{0}C. Calculate the correction for elevation, temperature and gradient with necessary check and provide final corrected length of runway.

                                                                                     [2+1+7]

8   a) Define time headway and distance headway. Explain the limitations of rotary intersection.

   b) The base year trip matrix for a study area consisting of three zones is given below. The production from the zone 1, 2 and 3 for the horizon year is expected to grow to 102, 110 and 128 respectively. The attractions from these zones are expected to increase to 112,128 and 126 respectively. Compute the trip matrix for the horizon year using doubly constrained growth factor model.

	1	2	3	O_j
1	22	32	30	84
2	38	32	26	96
3	34	38	27	99
d_j	94	102	83	279

                                                                                     [2+2+6]

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