RAILWAY AND AIRPORT ENGINEERING
(CIVL 3231)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Cant deficiency occurs when a vehicle travels around a curve at
(a) equilibrium speed
(b) speed lower than equilibrium speed
(c) speed higher than equilibrium speed
(d) all of the above.

(ii) If the monthly mean of the average daily temperature for the hottest month of the year is 25°C and the monthly mean of the maximum daily temperature of the same month of the year is 46°C, the ART is
(a) 32°C (b)35.5°C (c) 48°C (d) 45°C.

(iii) Narrow gauge has a gauge width of
(a) 0.762m (b) 0.543m (c) 0.862m (d) 0.686m.

(iv) Calm period is the percentage of time during which the wind intensity is less than
(a) 4.6 kmph (b) 6.4 kmph (c) 8.8 kmph (d) 9.8 kmph.

(v) Which of the following are used for servicing and repairs of aircraft?
(a) Apron (b) Hanger
(c) Terminal Building (d) Holding Apron.

(vi) Best wood for wooden sleepers is
(a) Chir (b) Deodar (c) Sal (d) Teak.

(vii) According to ICAO, all the marking on the runway are
(a) Yellow (b) white (c) black (d) red.

(viii) If α is switch angle and R is radius of the turnout, the length of the tongue rail is
(a) R tan α/2 (b) R tan α
(c) R sin α/2 (d) R cos α/2.

(ix) From the end of an instrumental runway, the approach surface rises outwards at
(a) 1 in 20 (b) 1 in 30
(c) 1 in 40 (d) 1in 50.

(x) Minimum depth of ballast prescribed of B. G. trunk lines of Indian Railways is
(a) 15cm (b)20cm (c) 25cm (d) 30cm.

Group – B

2. (a) What do you understand by super elevation, cant deficiency and negative cant? Derive the relationship of super elevation with gauge, speed and radius of the curve for different railway tracks.

(b) If on a 5° B. G. track, the average speed of different trains is 60 km/h. and allowable cant deficiency is one third of the maximum cant deficiency, what would be the permissible speed on the curve?

(3 + 4) + 5 = 12

3. (a) What do you understand by gradient? Define Momentum gradient, Pusher gradient and Ruling gradient. What should be the actual ruling gradient, if the ruling gradient of 1 in 250 has been fixed on a B. G. section and a horizontal curve of 2° is to be superimposed over it?

(b) Derive the relationship between radius (R) and versine of a curve (v).

(2 + 3 + 3) + 4 = 12

Group – C

4. (a) Calculate the necessary elements required to set out a 1 in 8.5 turnout, taking off from a straight B. G. track with its curve starting from the toe of the switch, i.e., tangential to the gauge face of the outer main rail and passes through theoretical nose of crossing, i.e. TNC. Given, heel-divergence (d) = 10.7cm.

(b) What is meant by a crossing? What are the essential requirements of a good crossing?

8 + (1 + 3) = 12

5. (a) Distinguish between stations and yards.

(b) Calculate the maximum permissible train load that can be pulled by a locomotive having four pairs of driving wheels carrying an axle load of 24 tonnes each (assume, μ = 0.2). The train has to run at a speed of 85 kmph on a straight level BG track. Calculate the reduction in speed if the train has to climb a gradient of 0.2%. If this gradient is to be climbed in a 3° curved track then how much the speed has to be reduced?

3 + 9 = 12

Group – D

6. (a) State the classification of airports according to ICAO.

(b) Illustrate 'turning zone' with a diagram and discuss its importance.

7 + 5 = 12

7. (a) Explain basic runway length. What are its requirements?

(b) An airport is proposed at an elevation of 400 m above mean sea level where the mean of maximum and mean of average daily temperature of the hottest month are 44.8°C and 26.2°C respectively. Maximum elevation difference along the proposed profile of runway is 6.3 m. Basic length of runway is 1260 m. Determine the actual length of runway to be provided.

4 + 8 = 12

Group – E

8. (a) Write short note on "Runway Marking" and "Taxiway Marking".

(b) What do you understand by the term "gate position"? What are the different systems of aircraft parking?

(3 + 3) + (2 + 4) = 12

9. (a) What do you understand by Mass-haul curve? Explain the procedure of working with this curve.

(b) What are special characteristics of airport drainage?

(2 + 4) + 6 = 12