RAILWAY & 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
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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)   How does the depth of ballast cushion affect rail section?
   (a) Higher the depth bigger the rail section
   (b) Depth is less, bigger the rail section
   (c) Depth is less, smaller the rail section
   (d) Depth and Rail section are same.

   (ii) To design a cross-over between parallel tracks, the required components are
   (a) two switch points, two acute angle crossings and two check rails
   (b) two switch points, two acute angle crossings and four check rails
   (c) two switch points, two acute angle crossings and six check rails
   (d) two switch points, four acute angle crossings and two check rails.

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

   (iv) Cant excess occurs when a vehicle travels around a curve at
   (a) equilibrium speed
   (b) speed higher than equilibrium speed
   (c) speed lower than equilibrium speed
   (d) maximum sanctioned speed.

   (v)   Grade compensation per degree of curve of BG track is
   (a) 0.02%   (b) 0.03%   (c) 0.04%   (d) 0.05%.

   (vi) The threshold markings are
   (a) 4 m wide   (b) 1 m clear space between adjacents
   (c) 45 m in length   (d) all of these.

   (vii) According to ICAO recommendation, the cross wind component for big aircrafts should not exceed
   (a) 15 kmph   (b) 25 kmph
   (c) 30 kmph   (d) 35 kmph.

   (viii) The runway orientation is made so that landing and take-off are
   (a) against the wind direction   (b) along the wind direction
   (c) perpendicular to wind direction   (d) 45^0 to the wind direction.

   (ix) As per ICAO, the basic runway length for A type airport is
   (a) 2500 m   (b) 2100 m   (c) 1500 m   (d) 900 m.

   (x)   Runway number which indicates the magnetic azimuth of the runway measured
   (a) anti-clockwise from north   (b) clockwise from south
   (c) clockwise from north   (d) anti-clockwise from south.

Group – B

2. (a) Write down the disadvantages of wooden sleepers and advantages of concrete sleepers.

   (b) Write short notes on the following:
   (i) Fish plate   (ii) Pandrol clip   (iii) Nylon liners.
   (3 + 3) + (2 × 3) = 12

3. (a) What are the advantages of using longer rails? What are the functions of railway sleepers?

   (b) Two high level platforms are to be provided on the inside as well as the outside of a 2^0 curve on a BG track with a superelevation of 100 mm. What should be the required extra clearances for these platforms, both on the inside and the outside of the curve. (Length of bogie = 21340 mm., c/c bogie distance = 14785 mm., height of platform = 840 mm.)
   (2 + 5) + 5 = 12

Group – C

4. (a) Describe the main constituents of a crossing. Draw neat sketches to show a point rail and a splice rail.

   (b) Write short notes on the following:
   (i) Double turnout   (ii) Diamond crossing.
   8 + (2 + 2) = 12

5. (a) Calculate all the elements required to set out a 1 in 12 turnout taking off from a straight BG 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 (T.N.C), given that the heel divergence as 114 mm.

(b) Write down the important features of junction stations.

8 + 4 = 12

Group – D

6. (a) An airport is proposed at an elevation of 400m above mean sea-level where the mean of maximum and mean of average daily temperatures of the hottest month are 44.8°C and 26.2°C respectively. The maximum elevation difference along the proposed profile of runway is 6.3m. If the basic length of runway is 1260m, determine the actual length of runway to be provided.

(b) What is the function of taxiways? Explain the following terms:
(i) Apron taxiway   (ii) Dual parallel taxiway   (iii) Terminal taxilane.

7 + 5 = 12

7. (a) What is wind rose diagram and state its type. What is the difference between them?

(b) Given the following wind data, draw the wind rose diagram and show the best runway orientation:

Wind direction	Percentage of winds
N	3·6
NNE	2·8
NE	7·8
ENE	5·0
E	10·3
ESE	2·2
SE	5·6
SSE	2·9
S	8·2
SSW	5·7
SW	7·3
WSW	4·9
W	4·9
WNW	7·6
NW	7·7
NNW	4·1
Calm wind: 9.4%	Total = 100%

4 + 8 = 12

Group – E

8. (a) Write down the principles with respect to the passengers flow that should be kept in view while deciding the layout of the terminal building.

(b) Write short note on runway threshold marking. Draw a neat sketch.

(c) What do you understand by mass-haul curve? What is the information obtained from mass-haul curve?

4 + 4 + (2 + 2) = 12

9. (a) Write down the advantages and disadvantages of different aircraft parking configurations.

(b) Write down the special characteristics of airport drainage.

(c) Write short note on taxiway marking. Draw a neat sketch.

4 + 4 + 4 = 12