

**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  
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) If  $\alpha$  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)  $R \cos \alpha/2$ .
- (ii) Grade compensation per degree of curve of BG track is  
(a) 0.02 %                      (b) 0.03%                      (c) 0.04%                      (d) 0.05%.
- (iii) Minimum depth of ballast prescribed for BG trunk lines of Indian Railway is  
(a) 150 mm                      (b) 200 mm                      (c) 250 mm                      (d) 300 mm.
- (iv) The tread of wheels is provided an outward slope of  
(a) 1 in 10                      (b) 1 in 15                      (c) 1 in 20                      (d) 1 in 25.
- (v) The starting resistance depends upon  
(a) speed of the train                      (b) slope of track  
(c) degree of curve                      (d) weight of the train.
- (vi) As per ICAO, the basic runway length for A type airport is  
(a) 2500 m                      (b) 2100 m                      (c) 1500 m                      (d) 900 m.
- (vii) According to ICAO, all the marking on the runway are  
(a) Red                      (b) Black                      (c) White                      (d) Yellow.
- (viii) Which of the following is used for parking of aircrafts, loading and unloading of passengers and cargo?  
(a) Terminal building                      (b) Hangar  
(c) Apron                      (d) Blast fence.
- (ix) 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.

- (x) Conical surface of approach area rises outwards  
(a) 1 in 10                      (b) 1 in 15                      (c) 1 in 20                      (d) 1 in 25.

**Group- B**

2. (a) Write short note on  
(i) Obligatory points    (ii) Sleeper density.                      [[(CO1)(Remember/LOCQ)]]  
(b) Write down the theory of coning with neat sketch.    [[(CO2)(Remember/LOCQ)]]  
**(2 × 3) + 6 = 12**
3. (a) What are advantages of using longer rails? What are the functions of railway sleepers?                      [[(CO2)(Remember/IOCQ)]]  
(b) Two high level platforms are to be provided on the inside as well as the outside of a 20 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.)                      [[(CO2)(Design/HOCQ)]]  
**(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.                      [[(CO2)(Remember/LOCQ)]]  
(b) Write short notes on the following:  
(i) Double turnout    (ii) Diamond crossing.                      [[(CO2)(Remember/LOCQ)]]  
**8 + (2 × 2) = 12**
5. (a) What are the different types of locomotives? Write down the advantage and disadvantage of diesel locomotives.                      [[(CO2)(Remember/LOCQ)]]  
(b) Write short note on terminal station.                      [[(CO2)(Remember/LOCQ)]]  
(c) What are the advantages of automatic signalling?    [[(CO2)(Evaluation/HOCQ)]]  
**(1 + 3) + 3 + 5 = 12**

**Group - D**

6. (a) Write short notes on any two:  
(i) Normal Landing.  
(ii) Normal Take-Off.  
(iii) Stopping in emergency.                      [[(CO3)(Understand/LOCQ)]]  
(b) What is the function of taxiways?                      [[(CO4)(Remember/LOCQ)]]  
**6 + 6 = 12**
7. (a) What is wind rose diagram and state its type. What is the difference between them?                      [[(CO5)(Understand/IOCQ)]]  
(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%

[(CO5)(Analyze/IOCQ)]  
**(4 + 8) = 12**

**Group - E**

8. (a) Write short note on runway threshold marking. Draw a neat sketch.  
 [(CO3)(Create/HOCQ)]  
 (b) Write down the objectives of surface drainage design in an airport.  
 [(CO5)(Understand/LOCQ)]  
**6 + 6 = 12**
9. (a) What is the function of a hangar? What are the factors that should be considered while designing a hangar?  
 [(CO5)(Analyse/IOCQ)]  
 (b) Write down the function of "approach lighting" on a runway.  
 [CO4(Remember/LOCQ)]  
 (c) Write down the objectives of surface drainage design in an airport.  
 [(CO3)/Remember/LOCQ]  
**4 + 4 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	50.6	29.5	19.9

**Course Outcome (CO):**

After the completion of the course students will be able to:

1. Understand the importance of railway infrastructure, planning and design and identify the factors governing the design.
2. Design and analyze the railway track system.
3. Get an idea about components of aircraft, airport planning and obstruction.
4. Design Runways and Taxiways.
5. Have a brief knowledge of airport layout and airport maintenance.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question;  
HOCQ: Higher Order Cognitive Question