

Name:

Id. No:

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
SECOND SEMESTER 2021 – 2022**

AIRPORT RAIL AND WATERWAYS – COMPREHENSIVE EXAMINATION

Course No: CE F425

Date: 12-05-2022 [8:00 AM start]

Duration: Part A (suggested time: 30 Minutes)

Max. Marks: 30

Note: This is question paper cum answer sheet. There is no separate answer sheet for Part – A

Fill up the blanks:

[10 x 1 = 10]

- 1) Railway Board has classified the Indian Railway lines on the basis of the importance of traffic carried and maximum permissible speed on the routes (True/False)
- 2) The main function of the rail is to offer the _____ (rigid/flexible) tyred wheel rolling on it a hard and unyielding surface.
- 3) Flat footed rails now are extremely popular and superior performance with _____ (larger/smaller) lateral strength
- 4) The cant at which the lateral forces are in equilibrium on a curve is called _____
- 5) In case of overriding switch, the stock rail occupies _____ (full section/partial section)
- 6) Wet runway generally requires _____ (shorter/longer) runways than dry runways
- 7) Lift of an aircraft depends on wing area (True/False)
- 8) FAARFIELD stands for _____
- 9) Cumulative Damage Factor (CDF) is the amount of the _____ (structural/functional) fatigue life of a pavement which has been used up.
- 10) In the case of flexible pavements, the primary structural response is _____ at the top of the subgrade

Answers to be written only here:

Q. No.	Answer	Q. No.	Answer
1		6	
2		7	
3		8	
4		9	
5		10	

Short answers:

[10 x 2 = 20]

Please write answers in the space provided only.

- 1) If percent of airplanes in “C” category is 50 and percent of airplanes in “D” is 5, what is the fleet index as per FAA?

2) In Airports, what is the difference between Technical capacity and acceptable capacity?

3) What is meant by advance starter signal?

4) Airfield pavements are generally designed considering only aircraft departures. Justify

5) What is meant by elasticity of traffic?

6) What is service ceiling?

7) What is the use of considering non-aircraft vehicles in the airport pavement design?

8) What is the problem associated with expansive clay?

9) What is the reason behind restricting the maximum longitudinal gradients in taxiways recommended by ICAO?

10) What is the reason for the minimum speed of train to be maintained at any cost?

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AIRPORT RAIL AND WATERWAYS – COMPREHENSIVE EXAMINATION

Course No: CE F425 (PART B)

Date: 12-05-2022 [8:00 AM start]

Duration: Suggested time: 150 Minutes (Open book)

Maximum Marks: 40 marks

Part B: Answers are to be written in answer sheets only and not on question paper.

Long Answers:

[40 marks]

1) Determine the actual length of the runway required for take-off (no need to calculate for landing) if the length required for landing and take-off under standard atmospheric conditions at sea level are 1900 m and 1600 m respectively. The airport elevation can be assessed using the following data and the airport reference temperature is 20 deg C. The effective gradient can be taken as 1%. [10 marks subject to calculation of RLs in the table]

Data for the calculation of Reduced Level:

In order to calculate the airport elevation, the following readings were taken with a tilting level and a 4 m levelling staff on a continuously sloping ground at common intervals of 30 m. The continuously sloping ground indicates that there is no undulation (it is either sloping downwards or sloping upwards). 0.800 (BM), 1.400, 2.300, 3.000, 3.550, 0.900, 1.200, 2.000, 2.850, 3.450, 0.700, 1.000, 1.400 (Final point). The RL of the starting point (BM) is 400 m. Make entries in a level book and apply the usual checks using Rise & Fall method. **The airport elevation above sea level is the RL corresponding to the spot level position of 1.400.** The below format may be used to calculate the RL.

Staff position	Back sight	Inter sight	Fore sight	Rise	Fall	RL	Remarks
1							
2							
3							

Important Note: After doing the above exercise, the RL corresponding to 11th staff position (airport elevation) has been found out to be 394 m. This is only meant for you to proceed with further calculations. However, if the calculation is not shown in the above table as to how you got 394 m, this question will be evaluated only for 6 marks instead of 10 marks.

2) The following are the data pertaining to the airport operations as per ACDM process. [10 marks]

The flight from Hyderabad is scheduled to land the airport (as per ATC) at New Delhi IGIA at 3 PM in the afternoon. However, the actual landing time (as per ATC) is 4 PM. The updated scheduled in-block time is 4:15 PM and the actual in-block time is 4:25 PM. The scheduled off-block time is 6:00 PM, but target off-block time is only 6:30 PM. Assume any suitable data accordingly if required.

a) Calculate actual taxi-in time [2 marks]

b) Calculate scheduled taxi-in time considering the updated scheduled in-block time. [2 marks]

c) Calculate the actual off-block time (considering that there is no other extra delay in the turnaround process) and the actual turnaround time. [2 marks]

d) Calculate the appropriate Target Start-UP Approval Time and appropriate Target Take-off Time considering the EXOT is 25 minutes. [2 marks]

e) What is EXIT and EXOT? How EXIT and EXOT affects entire planning operations? [2 marks]

3) A 400 m radius curve is introduced between straight portions of a BG railway line intersecting to form a deflection angle of 50 degrees. The speed for determining the equilibrium cant is fixed at 100 kmph and the maximum sectional speed is 120 kmph. Determine the equilibrium cant, the maximum permissible speed (considering the cant deficiency, cant excess), desirable length of transition curve. The maximum permissible cant and cant deficiency are 165 mm and 100 mm, respectively. Cant excess is restricted to 75 mm. The lowest speed of any train can be taken as 50 kmph. [10 marks]

4) Explain different ways by which the peak hour can be estimated with an example. [5 marks]

5) Comment on the following things [5 x 1 = 5 marks]

a) As per FAARFIELD procedure, how do you decide initial slab thickness?

b) Mention the expression for the calculation of CDF.

c) What is the reason behind 25% reduction in stress while calculating DF?

d) Is there any possibility of top-down cracking in Rigid Pavement?

e) PCN is $75/R/C/W/T$ – From this expression, how do you know whether there is any restriction on maximum tyre pressure?