BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
SECOND SEMESTER 2017 – 2018
AIRPORT RAIL AND WATERWAYS – COMPREHENSIVE EXAM

Course No: CE F425 **Date: 05-05-2018 [8 AM start]**
Duration: 180 Mins (Closed + Open book) **Max. Marks: 90**

I: Choose the best answers: **[10 x 1=10]**

1) Track modulus beyond _____ tones is in truly elastic range.
2) Derailment by flange climbing indicates that the derailing forces were powerful enough to overcome the normal stabilizing forces, and results in sudden derailment (True/False)
3) The purpose of hood is to provide the entry of light/external light on signal lens
4) CST sleeper has no scrap value (True/False)
5) Manganese increases the hardness of steel and thereby improving its strength and toughness (True/False)
6) The most significant factor affecting the turning radius is the exit speed of the aircraft and not the total angle of turn nor the passenger comfort (True/False)
7) The absolute minimum turning radius for supersonic aircrafts irrespective of any speed is (180 m)
8) The orientation of the runway should be such that the minimum wind coverage of about _____ (25 %, 50%, 75%, 95%) is obtained.
9) The maximum approximate percentage of space allocated for utilities and shops inside the terminal building is _____ (15%, 30%, 45%, 55%)
10) The transverse gradient recommended by ICAO for airport type "A" is higher than that of airport type "B" (True/False)

II: Short answers **[15 x 2 = 30]**

1) What is the concept of free flight?
2) What is meant by ponding with respect to airport drainage?
3) What is meant by LCN with respect to airport pavement design?
4) What is meant by reflection cracking?
5) What is the difference between unrestricted gate-use and restricted gate-use?
6) What is black hole effect with respect to runways?
7) What are the primary classification of harbors?
8) What is meant by bollard?
9) What is the difference between complete track renewal and through track renewal?
10) What is the application of wind tunnel testing with respect to railways?
11) What is the difference between EMS and EDS type of Magnetic Levitation?
12) What is the function of fish plated joint? What is meant by joggled fish plate?
13) Draw the wheel arrangements for "three dual wheels in tandem main gear with dual wheel nose gear.
14) Explain different types of switches in rails.
15) Explain track recording index of performance (CTR Value)

OPEN BOOK PORTION

III: Long answers: **[55 marks]**

1) Calculate the **actual length of the runway** from the following data. [10]
Airport Elevation: RL of 100 m
Airport Reference temperature: 30 degrees Celsius
Basic runway length = 500 m
Highest point along the length RL = 98 m; Lowest point along the length = RL = 95 m

2) Table below shows a 'typical wind data' for an airport site. **Determine the best orientation of the runway and percentage of time during which the runway can be used**. Does it require a second runway? If so, determine the total coverage. [20]

Wind direction	Percentage of time		
	(6-25) kmph	25-50 kmph	50-80 kmph
N	4.00	1.00	0.10
NNE	3.30	0.80	0.10
NE	2.50	0.03	0.00
ENE	4.50	2.00	0.00
E	3.50	0.03	0.00
ESE	5.50	4.00	0.00
SE	4.50	0.03	0.00
SSE	6.50	1.50	0.00
S	3.50	0.03	0.00
SSW	5.50	0.02	0.00
SW	2.50	0.03	0.00
WSW	4.50	0.02	0.00
W	2.50	0.03	0.00
WNW	7.50	5.00	0.00
NW	5.50	0.03	0.00
NNW	3.00	5.00	0.00

3) **Determine the Bending Moment in rail section and stresses in head and foot of the rail section** [52 kg/m] caused due to the train movement [WDM -2 Locomotive] powered by six axles travelling at the speed of 100 kmph. The track is having M+6 sleeper density and 250 mm ballast cushion as well. Use worn out section (10% reduction) for the calculation. There are six wheels (tandem axle arrangements) and axle load can be taken as 22.2 tonnes. Speed effect can be taken as 1.40 for the calculation of live wheel load. The following TIVs are to be taken for the calculation.
TIV due to initial loading = 3 tonnes
TIV due to elastic loading = 9 tonnes
The distance from the load to the point of contra flexure of the rail in cm can be computed using the empirical formula. [20]

4) Explain the concept of relief of stresses (railways track stresses) [5]