MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

DEPARTMENT OF CIVIL ENGINEERING VI SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2023

SUBJECT: RAILWAY AND AIRPORT ENGINEERING (CIE 3253)

Time: 2:30AM to 5:30 PM

Date: / /2023

MAX.MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Any data not provided may be suitably assumed.

Q. No	Question						
1A	What is controlled airspace and uncontrolled airspace? How are the airports						
	operating in controlled airspace and uncontrolled airspace are classified?						
	Define the following terms: i) Adzing of sleepers; ii) Blowing of Joint; iii) Check						
1B	Rails; iv) Flag stations; v) Shunting operations; vi) Throw of Switch						
1C	With a neat diagram explain the different classes of railway stations based on operations.						
2A	Define Grade compensation. What is the allowable ruling gradient for a railway track with meter gauge having the gradient 1 in 200 and a 5-degree curve?						
2B	Explain the wear and creep of rails.						
2C	What is Coning of a train wheel? With a neat sketch explain the importance of Coning on a straight track and disadvantage on curved track.						
ЗА	Determine the maximum permissible load that a BG locomotive with the three pairs of driving wheels bearing an axle load of 22 ton each can pull on a straight level track at a speed of 80 kmph. Also calculate the reduction in speed if the train has to run on a rising gradient of 1 in 200. What would be the further reduction in speed if the train has to negotiate a 4-degree curve on the rising gradient? Assume the coefficient of friction to be 0.2.	5	CO2				
3B	Identify the rail control devices that are shown in the figures below and explain their functions.	3	CO5				
3C	Define (i) approach lighting and (ii) threshold lighting used in Airport.	2	CO5				
4A	The length of the runway under standard conditions is 1660m. The airport route has an elevation of 270m. Its reference temperature is 32.64°C. If the runway is to be constructed with an effective gradient of 0.2%, determine the corrected runway length.	3	CO4				
4B	Examine the cases that are considered for determining the basic runway length.	3	CO4				

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4C	Design an exit taxiway joining a runway and a parallel main taxiway. The total angle of the turn is 40° and turn off speed is 85 kmph. The entrance curve radius is 801m. The runway width and taxiway width are 45m and 22.5m. What should be the separation clearance and available length of exit taxiway?										
5A	Following is the average wind data for 10 years, when wind intensity is above 6 km/h. An airport is to be designed for two runways. Determine the best runway orientation and calculate total wind coverage. Use the template given below (cut and paste the template to the working page of Epad). $\underbrace{\frac{\text{wind speed range in Kmph}}{\text{sector} \frac{6.4\cdot24}{24\cdot32} \frac{32\cdot40}{32\cdot40} \frac{40\cdot56}{40\cdot56}}$										
	N NNE ENE ESE SSE SSW SW WSW WSW WNW NWW	4.3 8.2 3.3 1.6 0.8 0.6 2.3 1.7 4.5 7.9 1.6 2.2 0.4 0.2 2.3 3.4	percentage 3.2 4.1 1.1 0.9 0.2 0.7 1.8 2.6 2.4 3.4 0.6 0.4 0.8 0.6 0.1 0.1 1.8 2.3	e of time 1.1 0.1 0.4 0.2 0.9 0.9 0.9 0.3 0.1 0 0 0 0 0.9 0.3 0.1 0 0 0 0 0 0 0 0 0 0 0 0 0	0.1 0.3 0 0 0.2 0 0 0.2 0.1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	NNW NNW NNW NNW NNW NNW NNW SSW SS					
5B	In the gradient operation for runway, it is proposed to have a rising gradient of 0.6% meeting a falling gradient of 0.8%. There is again an upgrade of 0.5%. Determine the length of the vertical curve and distance between the grade changes of runway as per FAA. Assume that the runway is required to handle jet aircraft.										
5C	Discuss about airport capacity and the factors affecting it.										