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**The Assam Royal Global University, Guwahati**

**Royal School of Engineering and Technology**

**B. Tech. (Civil Engineering) 6<sup>th</sup> Semester**

**Special Supplementary Examination, September 2023**

**Course Title: Railway Engineering and Airport Planning & Design**

**Course Code: CEE022D601**



**Time: 3 Hours**

**Maximum Marks: 70**

**Note: Attempt all questions as per instructions given.**

*The figures in the right-hand margin indicate marks.*

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**SECTION – A**

- Q.1. Attempt *all questions*. (Maximum Word Limit 50) (2x8=16)
- What is 'Gauge' in Railway Engineering?
  - Write down the benefits of adopting broad gauge as a uni-gauge system.
  - Explain in brief the components of a rail.
  - What is Composite Sleeper Index (CSI)?
  - Explain briefly the necessity for geometric design of tracks.
  - What is meant by superelevation or cant?
  - Explain in brief the various types of survey with respect to Airport Engineering.
  - Discuss the various factors which govern the layout of taxiways.

**SECTION – B**

- Q.2. Answer *any two* of the following. (6x2=12)
- What is the need and importance of a good alignment? Briefly explain the requirements of an ideal alignment.
  - What is final location survey? Discuss the broad objectives to be kept in mind for selection of best possible alignment in the final location survey.
  - Discuss the necessity and effect of coning of wheels.
- Q.3. Answer *any two* of the following. (7x2=14)
- Explain the need for using concrete sleepers in India.
  - Discuss the ill effects of a rail joint. Also explain the requirements of an ideal rail joint.
  - What are the requirements of a good ballast? Write a brief note on the different types of ballast used on Indian Railways.

- Q.4. Answer *any two* of the following. (7x2=14)
- Calculate the superelevation and maximum permissible speed for a  $2^\circ$  BG transitioned curve on a high-speed route with a maximum sanctioned speed of 110 kmph. The speed for calculating the equilibrium super elevation as decided is 80kmph and the booked speed of goods train is 50kmph.
  - Calculate the maximum permissible speed on a  $1^\circ$  curve on a Rajdhani route with a maximum sanctioned speed of 130km/hr. The superelevation provided is 50mm and transition length is 60m. Take note that the transition length of the curve cannot be increased due to the proximity of the yard.
  - Calculate the maximum permissible load that a BG locomotive with three pairs of driving wheels bearing an axle load of 22 tonnes each can pull on a straight level track at a speed of 80km/hr. Also calculate the reduction in speed if the train has to run on a rising gradient of 1 in 200. What would be further reduction in speed if the train has to negotiate a  $4^\circ$  curve on the rising gradient? Assume coefficient of friction as 0.2

- Q.5. Answer *any two* of the following. (7x2=14)
- What is airport capacity? Discuss in detail the various factors which affect the airport operating capacity.
  - For the hottest month of the year at the proposed airport site, the mean of the average daily temperature is  $38^\circ\text{C}$  and the mean of the maximum daily temperature is  $47^\circ\text{C}$ . Calculate the airport reference temperature. If the site is at mean sea -level with a level ground, calculate the actual runway length to be provided.
  - At an airport site at sea -level with standard atmospheric conditions, the runway lengths required for take-off and landing are 2000m and 2400m respectively. The proposed airport is situated at an altitude of 150m. If the airport reference temperature is  $25^\circ\text{C}$  and if the effective runway gradient is 0.35 percent, calculate the length of runway to be provided.