MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY
VI SEMESTER B.TECH. (CIVIL ENGINEERING)
END SEMESTER (Makeup) EXAMINATION, APRIL-MAY 2024
RAILWAY AND AIRPORT ENGINEERING (CIE 3253)
(- 05 - 2024)

TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.
3. Use of Formula book is permitted

Q. NO	QUESTION	MARKS	CO	BL
1A	Discuss the following in detail: a) Detonating signal, b) Semaphore signal, c) Advance starter signal, d) Routing signal, e) Pilot guard system.	**5**	**5**	**2**
1B	Describe the hauling capacity of a locomotive and compare the tractive effort of steam, diesel, and electric locomotives.	**3**	**2**	**5**
1C	Discuss the following terms related to the airport: i) Runway orientation; ii) Crosswind	**2**	**4**	**2**
2A	i) Discuss the concept of negative super elevation with the help of a neat diagram. ii) If an 8˚ curve track diverges from a main curve of 5˚ in the opposite direction in the layout of a B.G. yard, Evaluate superelevation and speed on the branch line if the maximum speed permitted on the main line is 45kmph.	**5**	**3**	**5**
2B	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 80kmph	**3**	**2**	**4**
2C	Discuss the various surveys carried out for an airport site selection.	**2**	**4**	**2**
3A	With the help of a neat sketch, illustrate the three controls that help in the movement of an aircraft.	**5**	**1**	**4**
3B	Discuss the following terms: a) Marshalling yards b) Class A Block station c) Railway alignment	**3**	**3**	**2**
3C	Discuss the wind direction indicator with a neat diagram.	**2**	**4**	**2**

<table>
<tr><td>4A</td><td>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 Evaluate the best runway orientation and assess total wind coverage.
<table>
<tr><th rowspan="2">sector</th><th rowspan="2">True azimuth</th><th colspan="3">Duration of wind in percent</th></tr>
<tr><th>6.4-25 kmph</th><th>25-50 kmph</th><th>50-75 kmph</th></tr>
<tr><td>N</td><td>0.00</td><td>5.3</td><td>4.2</td><td>0.2</td></tr>
<tr><td>NNE</td><td>22.50</td><td>6.4</td><td>8.7</td><td>0.6</td></tr>
<tr><td>NE</td><td>45.00</td><td>3.6</td><td>3.2</td><td>0.2</td></tr>
<tr><td>ENE</td><td>67.50</td><td>1.7</td><td>1.3</td><td>0</td></tr>
<tr><td>E</td><td>90.00</td><td>1</td><td>1.4</td><td>0</td></tr>
<tr><td>ESE</td><td>112.50</td><td>4.3</td><td>1.1</td><td>0</td></tr>
<tr><td>SE</td><td>135.00</td><td>3.5</td><td>2.3</td><td>0.2</td></tr>
<tr><td>SSE</td><td>157.50</td><td>2.3</td><td>1.8</td><td>0</td></tr>
<tr><td>S</td><td>180.00</td><td>4.9</td><td>3.6</td><td>0.4</td></tr>
<tr><td>SSW</td><td>202.50</td><td>4.8</td><td>3.4</td><td>0.4</td></tr>
<tr><td>SW</td><td>225.00</td><td>5.8</td><td>5.9</td><td>0.6</td></tr>
<tr><td>WSW</td><td>247.50</td><td>2.6</td><td>1.4</td><td>0</td></tr>
<tr><td>W</td><td>270.00</td><td>0.8</td><td>1.3</td><td>0</td></tr>
<tr><td>WNW</td><td>292.50</td><td>1</td><td>1.2</td><td>0</td></tr>
<tr><td>NW</td><td>315.00</td><td>2.3</td><td>1.1</td><td>0</td></tr>
<tr><td>NNW</td><td>337.50</td><td>1.5</td><td>1.8</td><td>0.2</td></tr>
</table></td><td>5</td><td>4</td><td>5</td></tr>
<tr><td>4B</td><td>Discuss the requirements of ballasts.</td><td>3</td><td>1</td><td>2</td></tr>
<tr><td>4C</td><td>Discuss the following terms with respect to aircraft parking configuration;
i) Nose-in and Angled nose-in; ii) Nose-out and angled nose-out</td><td>2</td><td>4</td><td>2</td></tr>
<tr><td>5A</td><td>Estimate the actual length of runway if the length required for landing and take-off under standard atmospheric conditions at sea level are 2000m and 1700m, respectively. The elevation of the airport site is 200m above sea level, and the airport reference temperature is 22˚C. Effective runway gradient may be taken as 0.5 %.</td><td>5</td><td>4</td><td>5</td></tr>
<tr><td>5B</td><td>With a neat diagram, discuss the requirements of basic runway length for the various cases.</td><td>3</td><td>4</td><td>2</td></tr>
<tr><td>5C</td><td>In the gradient operation for the runway, it is proposed to have a rising gradient of 0.4%, meeting a falling gradient of 0.6%. There is again an upgrade of 0.3%. Determine the length of the vertical curve and distance between the grade changes of the runway as per FAA. Assume that the runway is required to handle jet aircraft.</td><td>2</td><td>4</td><td>4</td></tr>
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