CLASS TEST

S.No. : 01 IG_CE_A+B_170422

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RAILWAY ENGINEERING

CIVIL ENGINEERING

Date of Test : 17/04/2022

ANSWER KEY ➤

1.	(c)	6	(c)	11.	(d)	16.	(c)	21.	(b)
2.	(c)	7.	(d)	12.	(d)	17.	(a)	22	(a)
3.	(c)	8.	(a)	13.	(c)	18.	(c)	23.	(a)
4.	(b)	9.	(d)	14.	(c)	19.	(c)	24.	(b)
5.	(c)	10.	(b)	15.	(c)	20.	(b)	25.	(c)

DETAILED EXPLANATIONS

1. (c)

The types of railway yards are:

(i) **Goods yard :** The main function is to provide facilities for receiving, loading, unloading and delivery of goods and the movement of goods vehicle.

(ii) **Marshalling yard :** The main function is breakup, reform and despatch of trains onwards. i.e., reception, sorting and departure.

(iii) **Locomotive yard :** Locomotive yard for housing locomotive. All the facilities for oil filing, watering repairing, cleaning, etc. are provided.

(iv) **Passenger bogie yard :** Passenger bogie yard provide facilities for safe movement of passenger and vehicles for the passengers.

4. (b)

Let W = Weight of the train

and x = Required gradient

$$\text{Resistance due to ruling gradient} = \frac{1}{200}W$$

$$\text{Resistance due to required gradient} = \frac{1}{x}W$$

$$\text{Resistance due to 2 degree curve} = 0.0004 \times 2 \times W$$

So, according to question

$$\frac{W}{x} + 0.0004 \times 2 \times W = \frac{1}{200}W$$

$$\Rightarrow \quad \frac{1}{x} = \frac{21}{5000}$$

$$\Rightarrow \quad \frac{1}{x} = \frac{1}{238.1} \simeq \frac{1}{238}$$

5. (c)

Degree of curvature of curve,

$D = 5°$

For a BG track, $G = 1.676$ m

$V = 80$ km/h

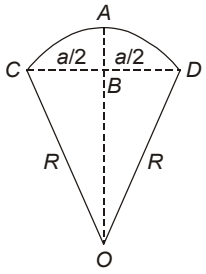
$$\text{Radius of curvature, } R = \frac{1718.9}{D} = \frac{1718.9}{5} = 343.78 \text{ m}$$

$$\text{Superelevation, } e = \frac{GV^2}{127R} = \frac{1.676 \times 80^2}{127 \times 343.78} = 0.2456 \text{ m} = 24.56 \text{ cm}$$

But equilibrium cant in a BG track should not be greater than 16.5 cm.

6 (c)

Given: Versine = $V = AB = 2$ cm, $a = 11.8$ m



$$AB \times (2AO - AB) = CB \times BD$$

(Property of triangle)

$$V \times (2R - V) = \frac{a}{2} \times \frac{a}{2}$$

$$2RV - V^2 = \frac{a^2}{4}$$

$$2RV = \frac{a^2}{4} \qquad (\because \quad V << R)$$

$$V = \frac{a^2}{8R}$$

$$R = \frac{(11.8)^2}{8 \times 0.02} = 870.25 \text{ m}$$

8. (a)

$$\left.\begin{aligned} L &= 7.2 \times e = 7.2 \times 15 = 108.0 \text{ m} \\ L &= 0.073 \text{ (CD)} \times V_{max} = 0.073 \times 7.5 \times 90 = 49.28 \text{ m} \\ L &= 0.073\, e V_{\max} = 0.073 \times 15 \times 90 = 98.55 \text{ m} \end{aligned}\right\} \text{ Max}$$

So, length of transition curve = 108 m

11. (d)

Curve lead = 2 GN = 2 × 1.676 × 8.5 = 28.5 m

13. (c)

Track modulus is an index for stiffness of track. It depends upon the gauge, the type of rails, the type and density of sleepers, the type and section of ballast and subgrade.

14. (c)

Flangeway clearance is the distance between adjacent faces of the stock rail (or running rail) and the check (or guard) rails. Heel divergence is the distance between the running faces of the stock rail and gauge face of the tongue rail when measured at the heel of the switch.

17. (a)

Corrugations occur:

(i) Where the ballast consists of broken bricks
(ii) Where brakes are applied to trains for stopping them
(iii) Where trains start
(iv) In electrified sections
(v) In long tunnels

21. (b)

Grade compensation for *BG* curve = 0.04% per degree curve

Total grade compensation = $0.04 \times 4 = 0.16\%$

Gradient provided = $0.5\% - 0.16\% = 0.34\%$

22 (a)

Length of track, $l = (D - G)\,N + G\,(4N - \sqrt{1+N^2}$

Given $N = 10$; $D = 5$ m, $G = 1.676$ m

$$l = (5 - 1.676) \times 10 + 1.676\,(4 \times 10 - \sqrt{1+10^2}) = 83.44 \text{ m}$$

The length of straight distance $= l - 4GN$

$= 83.44 - (4 \times 1.676 \times 10) = 16.4$ m

23. (a)

$$\text{Length of each rail, } n = \frac{26}{2} = 13 \text{ m}$$

Sleeper density $= n + 6 = 13 + 6 = 19$

$$\text{Total number of rails required} = \frac{1690}{13} = 130$$

$\therefore$ Total number of sleepers = Number of rails × Sleeper density

$= 130 \times 19 = 2470$

24. (b)

4 – 2 – 1 – 3

Starter signal – Warner signal – Outer signal Home signal

25. (c)

$R_{st} = 0.15\,W_L + 0.005\,W_W$

$= 0.15 \times 120 + 0.005 \times (20 \times 18)$

$= 18 + 1.8 = 19.8t$

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