S.No. : 01 PT_CE_A+B_230719

Railway Engineering

MADE EASY
India's Best Institute for IES, GATE & PSUs

Delhi | Noida | Bhopal | Hyderabad | Jaipur | Lucknow | Indore | Pune | Bhubaneswar | Kolkata | Patna

Web: www.madeeasy.in | **E-mail:** info@madeeasy.in | **Ph:** 011-45124612

CLASS TEST 2019-2020

CIVIL ENGINEERING

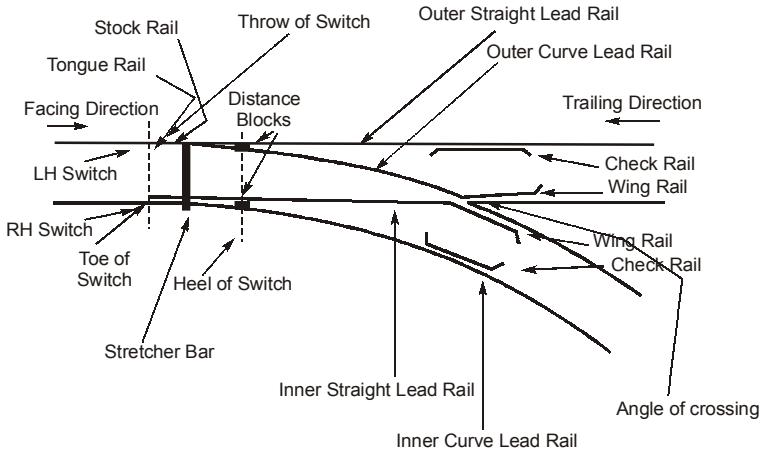
Date of Test : 23/07/2019

ANSWER KEY ➤ Railway Engineering

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

Detailed Explanations

1. (a)



RIGHT HANDED TURNOUT

Facing direction is that where trains pass over the switches first and then they pass over the crossing. Thus the correct sequence is

Throw of switch, toe of switch, Tongue rain, lead rail and crossing.

3. (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.

5. (b)

Grade compensation = $0.04 \times 3 = 0.12\%$

$$\text{Permissible gradient} = \frac{1}{250} - \frac{12}{10000} = \frac{1}{357}$$

6. (b)

For a BG track in a transition zone

$$V = 4.35\sqrt{R-67}$$

Here, $V = 110$ km/h

$$\therefore \quad 110 = 4.35\sqrt{R-67}$$

$$\Rightarrow \quad R = 706.45 \text{ m}$$

$$\text{Degree of curvature, } D = \frac{1718.9}{R} = \frac{1718.9}{706.45} = 2.43°$$

7. (c)

Degree of curvature of curve,

$$D = 5°$$

For a BG track, $G = 1.676\ \text{m}$

$V = 80\ \text{km/h}$

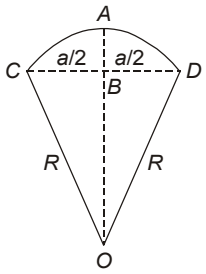
$$\text{Radius of curvature, } R = \frac{1718.9}{D} = \frac{1718.9}{5} = 343.78\ \text{m}$$

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

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

8 (c)

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



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

(Property of triangle)

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

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

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

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

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

12. (a)

$$\text{H.C} = \mu wn = \frac{1}{6} \times 4 \times 225 = 15\ \text{tonnes}$$

13. (c)

$$\text{Curve resistance} = 0.0004\ DW$$
$$= 0.0004 \times 4 \times 50 = 0.08\ \text{tonnes}$$

15. (d)

$$\text{Curve lead} = 2\ GN = 2 \times 1.676 \times 8.5 = 28.5\ \text{m}$$

16. (a)

The distance at which outer signal is to be placed, is found on the basis of maximum allowable speed. It is 540 m for BG track in India.

18. (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

22. (b)

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

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

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

23 (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

24. (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

$= 130 \times 19 = 2470$

■■■■