POSTAL Book Package 2023

CIVIL ENGINEERING

Railway, Airport, Dock, Harbour & Tunnel Engineering

Objective Practice Sets

Contents

MADE EASY Publications

1 CHAPTER
Railway Track

Q.1 On railway track, corrugations normally occur on stretches where
(a) trains stop or start
(b) steel sleepers are used
(c) there are horizontal curves
(d) there are vertical curves

Q.2 A train is Hauled by 2-8-2 locomotive with 22.5 tones load an each driving axle. Assuming the coefficient of rail wheel friction to be 0.25. What would be the hauling capacity of the locomotive?
(a) 15.0 tones (b) 22.5 tones
(c) 45.0 tones (d) 90.0 tones

Q.3 In a railway track, permissible gauge with tolerance under loaded condition is
(a) $G + 0.1$ mm (b) $G + 1.5$ mm
(c) $G - 0.1$ mm (d) $G - 1.5$ mm

Q.4 Tractive resistance can be due to
1. train resistance
2. resistance due to track profile
3. resistance due to starting and acceleration
4. wind resistance

The correct answer is
(a) 1, 2 and 3 (b) 1, 3 and 4
(c) 2, 3 and 4 (d) 1, 2, 3 and 4

Q.5 The total train resistance is given by
(a) $0.0016w + 0.00008wv + 0.0000006\ wv^2_w$
(b) $0.016w + 0.0008wv + 0.000006wv^2_w$
(c) $0.00016w + 0.000008wv + 0.00000006\ wv^2_w$
(d) $0.16w + 0.008wv + 0.0006wv^2_w$
Where, 'w' is weight of train in tons, v is train speed in kmph
v_w is speed of wind

Q.6 Minimum gradient at station yards is generally limited to
(a) 1 in 1000 (b) 1 in 750
(c) 1 in 1200 (d) Zero

Q.7 Breathing length of LWR is the
(a) end portion which gets affected by temperature variation
(b) end portion which does not get affected by temperature variation
(c) central portion which gets affected by temperature variation
(d) central portion which does not get affected by temperature variation

Q.8 What should be length of track in meter to overcome temperature stress. When it is given $A = 60\ cm^2$, $\alpha = 1.25 \times 10^{-5}/°C$, $E = 21 \times 10^5\ kg/cm^2$ and rise in temperature is 30°C.
Assume 700 kg/km as resistance to track movement.

Q.9 Find the theoretical length of LWR in meter beyond which central portion of 52 kg rail would not subjected to any longitudinal movement due to 30°C temperature increases.
Given, $A_s = 66.15\ cm^2$, $\alpha = 11.5 \times 10^{-6}/°C$
$E_s = 21 \times 10^6\ kg/cm^2$, Spacing = 60 cm
Resistance (R) = 300 kg
Rise in temperature (t) = 30°C

Q.10 **Statement (I):** While laying the railway track some time temporary track is also laid for transporting the material.
Statement (II): To distinguish temporary track and final alignment the final alignment is said to be permanent track.
(a) Both Statement (I) and Statement (II) are individually true; and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true; but Statement (II) is NOT the correct explanation of Statement (I)
(c) Statement (I) is true; but Statement (II) is false
(d) Statement (I) is false; but Statement (II) is true

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Answers Railway Track

1. (a) 2. (b) 3. (b) 4. (d) 5. (a) 6. (a) 7. (a) 8. 67500 9. 190.8 10. (b)

Explanations Railway Track

1. (a)
   - The corrugations of rail consist of minute depression on the surface of rails.
   - These are usually created at the place where either breaks are applied or train start.
   - When train passes over it roaring sound occurs.

2. (b)
   Hauling capacity of the locomotive = μWN
   Here, μ = Coefficient of friction between wheel and ail = 0.25
   N = No. of driving axle = 4
   W = Weight of axle = 22.5
   = 0.25 × 22.5 × 4
   = 22.5 tones

3. (b)
   The permissible gauge with tolerance under loaded condition is
   G + 1.5 mm
   Where, G = Gauge

5. (a)
   Total frictional resistance = 0.0016 W (W = weight of train in tonnes).
   Resistance due to wave action, track irregularity and speed = 0.00008 WV
   (V-speed of train in kmph).
   Resistance due to wind = 0.000000 6 WV_W^2
   (V_w velocity of wind in kmph).

6. (a)
   Maximum gradient permitted on station yard is 1 in 400 though minimum is 1 in 1000.

7. (a)
   Due to variation in temperature and inability of the resisting force offered by the ballast and sleeper fastening etc. to the rail, the longitudinal movement of the long welded rail takes place.
   The portion of the long welded rail at each end, which under goes changes in its length due to temperature variation is called breathing length. For B.G. track in Indian conditions this length is about 125 m.

$$L = \frac{AE\alpha\Delta T}{r}$$

   where
   L is breathing length
   A is cross-section area of rail. It is 76.86 cm^2 for 60 kg rail.
   E is modulus of elasticity
   = 2.15 × 10^6 kg/cm^2
   α is coefficient of thermal expansion
   = 1.152 ×10^{-5} per°C
   ΔT is temperature change
   = 38°C for Zone I, 40°C for Zone II, 45°C for Zone III and 48°C for Zone IV
   r is resistance of sleeper, 870 kg for ST sleeper and 640 kg for wooden sleeper

8. 67500 (67490 to 67510)
   The force required to prevent the expansion due to temperature is
   $F = EA\alpha T$
   = 21 × 10^5 × 1.25 × 10^{-5} × 60 × 30
   = 47250 kg
   Hence length of track required to overcome temperature stress

$$L_t = \frac{47250}{700} = 67.5 \text{ km}$$

   = 67500 m

9. 190.8 (185 to 195)
   The internal force developed due to rise in temperature
   $F_s = \alpha T E_s A_s$