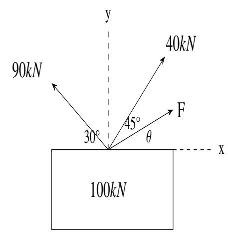
2014-CE-27-39

AI24BTECH11023 - Tarun Reddy Pakala

27) A box of weight 100 kN shown in figure is to be lifted without swinging. If all forces are coplanar, the magnitude and direction (θ) of the force (F) with respect to x-axis should be

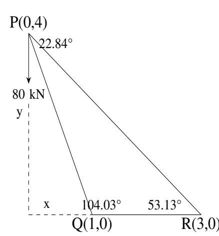


a) $F = 56.389kN$ and $\theta = 28.28°$
b) $F = -56.389kN$ and $\theta = -28.28°$
c) $F = 9.055kN$ and $\theta = 1.414°$
d) $F = -9.055kN$ and $\theta = -1.414°$

28) A particle moves along a curve whose parametric equations are: $x = t^3+2t$, $y = -3e^{-2t}$ and $z = 2\sin 5t$, where x, y and z show variations of the distance covered by the particle (in cm) with time t (in s). The magnitude of the acceleration of the particle (in $\frac{cm}{s^2}$) at $t = 0$ is __________

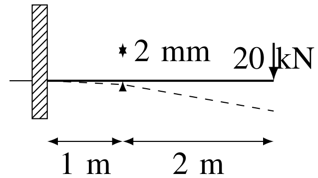
29) A traffic office imposes on an average 5 number of penalties daily on traffic violators. Assume that the number of penalties on different days is independent and follows a Poisson distribution. The probability that there will be less than 4 penalties in a day is __________

30) Mathematical idealization of a crane has three had three bars with their vertices arranged as shown in the figure with a load of 80 kN hanging vertically. The coordinates of the vertices are given in parentheses. The force in the member QR, F_{QR} will be

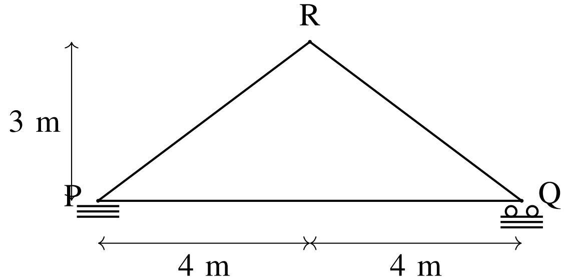


a) 30 kN Compressive
b) 30 kN Tensile
c) 50 kN Compressive
d) 50 kN Tensile

31) For the cantilever beam of span 3 m (shown below), a concentrated load of 20 kN applied at the free end causes a vertical displacement of 2 mm at a section located at a distance of 1 m from the fixed end. If a concentrated vertically downward load of 10 kN is applied at the section located at a distance of 1 m from the fixed end (with no other load on the beam), the maximum vertical displacement in the same beam (in mm) is __________



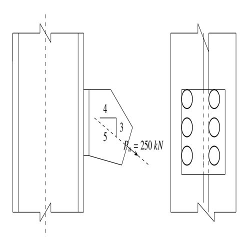
32) For the truss shown below, the member PQ is short by 3 mm. The magnitude of vertical displacement of joint R (in mm) is __________



33) A rectangular beam of width (b) 230 mm and effective depth (d) 450 mm is reinforced with four bars of 12 mm diameter. The grade of concrete is $M20$ and grade of steel is $Fe500$. Given that for $M20$ grade of concrete the ultimate shear strength, $\tau_{uc} = 0.36 \frac{N}{mm^2}$ for steel percentage, $p = 0.25$, and $\tau_{uc} = 0.48 \frac{N}{mm^2}$ for $p = 0.50$. For a factored shear force of 45 kN, the diameter (in mm) of $Fe500$ steel two legged stirrups to be used at spacing of 375 mm, should be

a) 8
b) 10
c) 12
d) 16

34) The tension and shear force (both in kN) in the bolt of the joint, as shown below, respectively are



a) 30.33 and 20.00
b) 30.33 and 25.00
c) 33.33 and 20.00
d) 33.33 and 25.00

35) For a beam of cross-section, width=230 mm and effective depth=500 mm, the number of rebars of 12 mm diameter required to satisfy minimum tension reinforcement requirement specified by $IS : 456 - 2000$ (assuming grade of steel reinforcement as Fe500) is __________

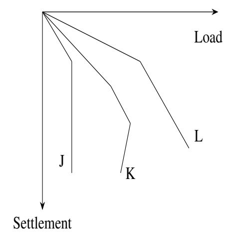
36) In a reinforced concrete section, the stress at the extreme fiber in compression is 5.8 MPa. The depth of neutral axis in the section is 58 mm and the grade of concrete is $M25$. Assuming linear elastic behavior of the concrete, the effective curvature of the section (in per mm)

a) 2.0×10^{-6}
b) 3.0×10^{-6}
c) 4.0×10^{-6}
d) 5.0×10^{-6}

37) Group I contains representative load-settlement curves for different modes of bearing capacity failures of sandy soil. Group II enlists the various failure characteristics. Match the load-settlement curves

with the corresponding failure characteristics.

Group I	**Group II**
(P) Curve J	(i) No apparent heaving of soil around the footing
(Q) Curve K	(ii) Rankine's passive zone develops imperfectly
(R) Curve L	(iii) Well defined slip surface extends to ground surface



a) $P-1,\ Q-3,\ R-2$
b) $P-3,\ Q-2,\ R-1$
c) $P-3,\ Q-1,\ R-2$
d) $P-1,\ Q-2,\ R-3$

38) A given cohesionless soil has $e_{max} = 0.85$ and $e_{min} = 0.50$. In the field, the soil is compacted to a mass density of 1800 $\frac{kg}{m^3}$ at a water content of 8%. Take the mass density of water as 1000 $\frac{kg}{m^3}$ and G_s as 2.7. The relative density (in %) of the soil is

a) 56.43
b) 60.25
c) 62.87
d) 65.71

39) The following data are given for the laboratory sample.
$\sigma'_0 = 175\ kPa;\ e_o = 1.1;\ \sigma'_o + \Delta\sigma'_o = 300\ kPa;\ e = 0.9$
If the thickness of the clay specimen is 25 mm, the value of the coefficient of volume compressibility is ___________$\times 10^{-4}\ \frac{m^2}{kN}$