GATE
CE - 2008

EE24BTECH11061 - Rohith Sai

Single Correct 1 Mark each

1) The capacities of "One-way 1.5 m wide sidewalk (persons per hour)" and "One-way 2-lane urban road (PCU per hour, with no frontage access, no standing vehicles and very little cross traffic)" are respectively

a) 1200 and 2400
b) 1800 and 2000
c) 1200 and 1500
d) 2000 and 1200

2) The shape of the STOP sign according to IRC:67-2001 is

a) circular
b) triangular
c) octagonal
d) rectangular

3) The type of surveying in which the curvature of the earth is taken into account is called

a) Geodetic surveying
b) Plane surveying
c) Preliminary surveying
d) Topographical surveying

Single Correct 2 Marks each

4) The equation $k_x \frac{\partial^2 h}{\partial x^2} + k_z \frac{\partial^2 h}{\partial z^2} = 0$ can be transformed to $\frac{\partial^2 h}{\partial x_t^2} + \frac{\partial^2 h}{\partial z^2} = 0$ by substituting

a) $x_t = x\frac{k_z}{k_x}$
b) $x_t = x\frac{k_x}{k_z}$
c) $x_t = x\sqrt{\frac{k_x}{k_z}}$
d) $x_t = x\sqrt{\frac{k_z}{k_x}}$

5) The value of $\int_0^3 \int_0^x (6 - x - y)\,dxdy$ is

a) 13.5
b) 27.0
c) 40.5
d) 54.0

6) Three values of x and y are to be fitted in a straight line in the form $y = a + bx$ by the method of least squares. Given: $\sum x = 6$, $\sum y = 21$, $\sum x^2 = 14$ and $\sum xy = 46$, the values of a and b are respectively

a) 2 and 3
b) 1 and 2
c) 2 and 1
d) 3 and 2

7) Solution of $\frac{dy}{dx} = -\frac{x}{y}$ at $x = 1$ and $y = \sqrt{3}$ is

a) $x - y^2 = -2$
b) $x + y^2 = 4$
c) $x^2 - y^2 = -2$
d) $x^2 + y^2 = 4$

8) If probability density function of a random variable X is

$$f(x) = x^2 \text{ for } -1 \leq x \leq 1, \text{ and} = 0 \text{ for any other value of } x$$

then, the percentage probability $P\left(-\frac{1}{3}\right) \leq x \leq \frac{1}{3}$ is

a) 0.247
b) 2.47
c) 24.7
d) 247

9) The Eigen values of the matrix $\mathbf{P} = \begin{pmatrix} 4 & 5 \\ 2 & -5 \end{pmatrix}$ are

a) -7 and 8
b) -6 and 5
c) 3 and 4
d) 1 and 2

10) A person on a trip has a choice between private car and public transport. The probability of using a private car is 0.45 . While using the public transport, further choices available are bus and metro, out of which the probability of commutating by a bus is 0.55. In such a situation, the probability (rounded up to two decimals) of using a car, bus and metro, respectively would be

a) 0.45, 0.30 and 0.25
b) 0.45, 0.25 and 0.30
c) 0.45, 0.55 and 0.00
d) 0.45, 0.35 and 0.20

11) The following simultaneous equations

$$x + y + z = 3$$
$$x + 2y + 3z = 4$$
$$x + 4y + kz = 6$$

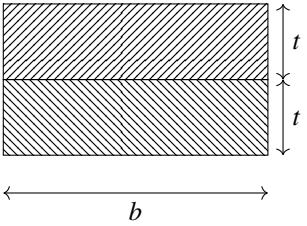
will **NOT** have a unique solution for k equal to

a) 0
b) 5
c) 6
d) 7

12) The inner (dot) product of two vectors **P** and **Q** is zero. The angle (degrees) between the two vectors is

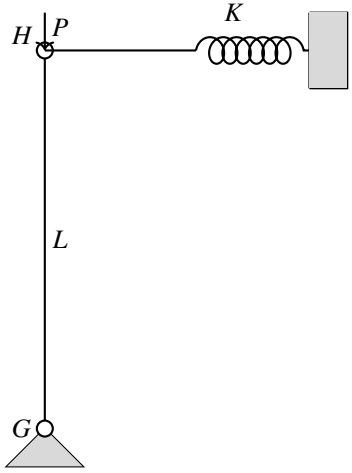
a) 0
b) 30
c) 90
d) 120

13) Cross-section of a column consisting of two steel strips, each of thickness t and width b is shown in the figure below. The critical loads of the column with perfect bond and without bond between the strips are P and P_0 respectively. The ratio $\frac{P}{P_0}$



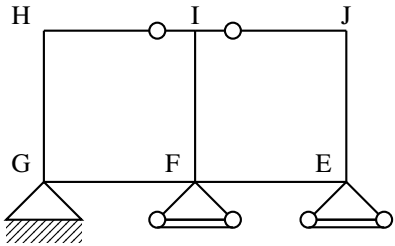
a) 2
b) 4
c) 6
d) 8

14) A rigid bar GH of length L is supported by a hinge and a spring of stiffness K as shown in the figure below. The buckling load P_{Cr}, for the bar will be



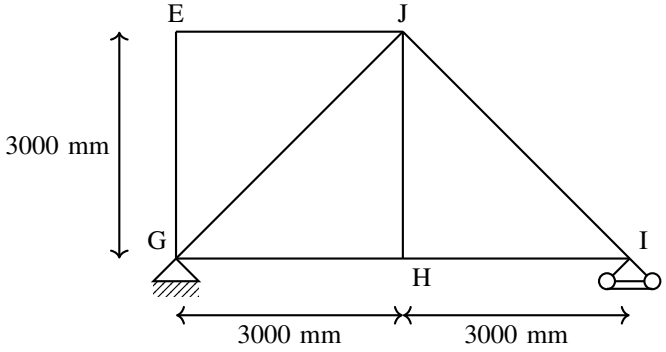
a) 0.5 KL
b) 0.8 KL
c) 1.0 KL
d) 1.2 KL

15) The degree of static indeterminacy of the rigid frame having two internal hinges as shown in the figure below is:



a) 8
b) 7
c) 6
d) 5

16) The members EJ and IJ of a steel truss shown in the figure below are subjected to a temperature rise of 30°C. The coefficient of thermal expansion of steel is 0.000012 per °C per unit length. The displacement (mm) of joint **E** relative to joint **H** along the direction HE of the truss, is



a) 0.255
b) 0.589
c) 0.764
d) 1.026

17) The maximum shear stress in a solid shaft of circular cross-section having diameter d subjected to a torque T is τ. If the torque is increased by four times and the diameter of the shaft is increased by two times, the maximum shear stress in the shaft will be

a) 2τ
b) *tau*
c) $\frac{\tau}{2}$
d) $\frac{\tau}{4}$