

GATE

EE1030
2008

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(EE24BTECH11062)

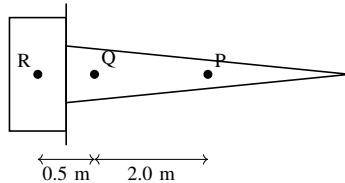
QUESTIONS- 1 to 17

- 1) In the Taylor series expansion of e^x about $x = 2$, the coefficient of $(x - 2)^4$ is
 - a) $\frac{1}{4!}$
 - b) $\frac{2^4}{4!}$
 - c) $\frac{e^2}{4!}$
 - d) $\frac{e^4}{4!}$
- 2) Given that $\ddot{x} + 3x = 0$, and $x(0) = 1, \dot{x}(0) = 0$, what is $x(1)$?
 - a) -0.99
 - b) -0.16
 - c) 0.16
 - d) 0.99
- 3) The value of $\lim_{x \rightarrow 8} \frac{x^{1/3} - 2}{(x - 8)}$ is
 - a) $\frac{1}{16}$
 - b) $\frac{1}{12}$
 - c) $\frac{1}{8}$
 - d) $\frac{1}{4}$
- 4) A coin is tossed 4 times. What is the probability of getting heads exactly 3 times?
 - a) $\frac{1}{4}$
 - b) $\frac{3}{8}$
 - c) $\frac{1}{2}$
 - d) $\frac{3}{4}$
- 5) The matrix $\begin{bmatrix} 1 & 2 & 4 \\ 3 & 0 & 6 \\ 1 & 1 & p \end{bmatrix}$ has one eigenvalue equal to 3. The sum of the other two eigenvalues is
 - a) p
 - b) $p - 1$
 - c) $p - 2$
 - d) $p - 3$
- 6) The divergence of the vector field $(x - y)\hat{i} + (y - x)\hat{j} + (x + y + z)\hat{k}$ is
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 7) The transverse shear stress acting in a beam of rectangular cross-section, subjected to a transverse shear load, is
 - a) variable with maximum at bottom of the beam
 - b) variable with maximum at top of the beam
 - c) uniform
 - d) variable with maximum on the neutral axis

- 8) A rod of length L and diameter D is subjected to a tensile load P . Which of the following is sufficient to calculate the resulting change in diameter?
- Young's modulus
 - Shear modulus
 - Poisson's ratio
 - Both Young's modulus and shear modulus
- 9) A straight rod of length $L(t)$, hinged at one end and freely extensible at the other end, rotates through an angle $\theta(t)$ about the hinge. The time t , $L(t) = 1\text{ m}$, $\dot{L}(t) = 1\text{ m/s}$, $\theta(t) = \frac{\pi}{4}\text{ rad}$ and $\dot{\theta}(t) = 1\text{ rad/s}$. The magnitude of the velocity at the other end of the rod is

- 1 m/s
- $\sqrt{2}$ m/s
- $\sqrt{3}$ m/s
- 2 m/s

- 10) A cantilever type gate hinged at Q is shown in the figure. P and R are the centres of gravity of the cantilever part and the counterweight respectively. The mass of the cantilever part is 75 kg. The mass of the counterweight, for static balance, is



- 75 kg
 - 150 kg
 - 225 kg
 - 300 kg
- 11) A planar mechanism has 8 links and 10 rotary joints. The number of degrees of freedom of the mechanism, using Gruebler's criterion, is
- 0
 - 1
 - 2
 - 3
- 12) An axial residual compressive stress due to a manufacturing process is present on the outer surface of a rotating shaft subjected to bending. Under a given bending load, the fatigue life of the shaft in the presence of the residual compressive stress is
- decreased
 - increased or decreased, depending on the external bending load
 - neither increased nor decreased
 - increased
- 13) 2 moles of oxygen are mixed adiabatically with another 2 moles of oxygen in a mixing chamber, so that the final total pressure and temperature of the mixture become same as those of individual constituents at their initial states. The universal gas constant is given as R . The change in entropy due to mixing, per mole of oxygen, is given by

- a) $-R \ln 2$ b) 0 c) $R \ln 2$ d) $R \ln 4$

14) For flow of fluid over a heated plate, the following fluid properties are known: viscosity = 0.001 Pa.s ; specific heat at constant pressure = 1kJ/kg.K ; thermal conductivity = 1 W/m.K. The hydrodynamic boundary layer thickness at a specific location on the plate is 1 mm. The thermal boundary layer thickness at the same location is

- a) 0.001 mm b) 0.01 mm c) 1 mm d) 1000 mm

15) For the continuity equation given by $\vec{V} \cdot \vec{V} = 0$ to be valid, where \vec{V} is the velocity vector, which one of the following is a necessary condition?

- a) steady flow
b) irrotational flow
c) inviscid flow
d) incompressible flow

16) Which one of the following is NOT a necessary assumption for the air-standard Otto cycle?

- a) All processes are both internally as well as externally reversible.
b) Intake and exhaust processes are constant volume heat rejection processes.
c) The combustion process is a constant volume heat addition process
d) The working fluid is an ideal gas with constant specific heats.

17) In an M/M/I queuing system, the number of arrivals in an interval of length T is a Poisson random variable (i.e. the probability of there being n arrivals in an interval of length T is $\frac{e^{-\lambda T} (\lambda T)^n}{n!}$). The probability density function $f(t)$ of the inter-arrival time is given by

- a) $-R \ln 2$ b) 0 c) $R \ln 2$ d) $R \ln 4$