

2010 Mechanical Engineering

1

AI24BTECH11003 - Badde Vijaya Sreyas

- 1) The parabolic arc $y = \sqrt{x}$, $1 \leq x \leq 2$ is revolved around the axis. The volume of the solid of revolution is
- a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{3\pi}{4}$ d) $\frac{3\pi}{2}$
- 2) The Blasius equation, $\frac{d^3 f}{d\eta^3} + \frac{f}{2} \frac{d^2 f}{d\eta^2} = 0$, is a
- a) second order nonlinear ordinary differential equation
b) third order nonlinear ordinary differential equation
c) third order linear ordinary differential equation
d) mixed order nonlinear ordinary differential equation
- 3) The value of the integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ is
- a) $-\pi$ b) $-\frac{\pi}{2}$ c) $\frac{\pi}{2}$ d) π
- 4) The modulus of the complex number $\left(\frac{3+4i}{1-2i}\right)$
- a) 5 b) $\sqrt{5}$ c) $\frac{1}{\sqrt{5}}$ d) $\frac{1}{5}$
- 5) The function $y = |2 - 3x|$
- a) is continuous for all $\forall x \in R$ and differentiable $\forall x \in R$
b) is continuous for all $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{3}{2}$
c) is continuous for all $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{2}{3}$
d) is continuous for all $\forall x \in R$ except at $x = 3$ and differentiable $\forall x \in R$
- 6) Mobility of a statically indeterminate structure is
- a) ≤ -1 b) 0 c) 1 d) ≥ 2
- 7) There are 2 points P and Q on a planar rigid body. The relative velocity between the two points
- a) should always be along PQ
b) can be oriented along any direction
c) should always be perpendicular to PQ
d) should be along QP when the body undergoes pure translation
- 8) The state of plane-stress at a point is given by $\sigma_x = -200\text{MPa}$, $\sigma_y = 100\text{MPa}$, and $\tau_{xy} = 100\text{MPa}$. The maximum shear stress in MPa is

- a) 111.8 b) 150.1 c) 180.3 d) 223.6
- 9) Which of the following statements is INCORRECT?
- Grashof's rule states that for a planar crank-rocker four bar mechanism, the sum of the shortest and longest link lengths cannot be less than the sum of the remaining two link lengths.
 - Inversions of a mechanism are created by fixing different links one at a time.
 - Geneva mechanism is an intermittent motion device
 - Gruebler's criterion assumes mobility of a planar mechanism to be one.
- 10) The natural frequency of a spring-mass system on earth is ω_n . The natural frequency of this system on the moon ($g_{moon} = \frac{g_{earth}}{6}$) is
- a) ω_n b) $0.408\omega_n$ c) $0.204\omega_n$ d) $0.167\omega_n$
- 11) Tooth interference in an external involute spur gear pair can be reduced by
- decreasing center distance between gear pair
 - decreasing module
 - decreasing pressure angle
 - increasing number of gear teeth
- 12) For the stability of a floating body, under the influence of gravity alone, which of the following is TRUE?
- Metacentre should be below centre of gravity
 - Metacentre should be above centre of gravity
 - Metacentre and centre of gravity must lie on the same horizontal line
 - Metacentre and centre of gravity must lie on the same vertical line
- 13) The maximum velocity of a one-dimensional incompressible fully developed viscous flow, between two fixed parallel plates, is $6\frac{m}{s}$. The mean velocity (in $\frac{m}{s}$) of the flow is
- a) 2 b) 3 c) 4 d) 5