2009 ME 13-24

AI24BTECH11031 - Shivram S

1) The rotor shaft of a large electric motor supported between short bearings at both the ends shows a deflection of $1.8mm$ in the middle of the rotor. Assuming the rotor to be perfectly balanced and supported at knife edges at both the ends, the likely critical speed (in rpm) of the shaft is

a) 350 b) 705 c) 2810 d) 4430

2) A solid circular shaft of diameter d is subjected to a combined bending moment M and torque T. The material property to be used for designing the shaft using the relation $\frac{16}{\pi d^3}\sqrt{M^2+T^2}$ is

a) ultimate tensile stringth (S_u)
b) tensile yield strength $\left(S_y\right)$
c) torsional yield strength $\left(S_{sy}\right)$
d) endurance strength (S_e)

3) The effective number of lattice points in the unit cell of simple cubic, body centered cubic, and face centered cubic space lattices, respectively, are

a) 1, 2, 2 b) 1, 2, 4 c) 2, 3, 4 d) 2, 4, 4

4) Friction at the tool-chip interface can be reduced by

a) decreasing the rake angle
b) increasing the depth of cut
c) decreasing the cutting speed
d) increasing the cutting speed

5) Two streams of liquid metal which are not hot enough to fuse properly result into a casting defect known as

a) cold shut b) swell c) sand wash d) scab

6) The expected time (t_e) of a PERT activity in terms of optimistic time (t_o), pessimistic time $\left(t_p\right)$ and most likely time (t_l) is given by

a) $\frac{t_o+4t_l+t_p}{6}$
b) $\frac{t_o+4t_p+t_l}{6}$
c) $\frac{t_o+4t_l+t_p}{3}$
d) $\frac{t_o+4t_l+t_l}{3}$

7) Which of the following is the correct data structure for solid models?

a) solid part $\rightarrow$ faces $\rightarrow$ edges $\rightarrow$ vertices

b) solid part → edges → faces → vertices
c) vertices → edges → faces → solid parts
d) vertices → faces → edges → solid parts

8) Which of the following forecasting methods takes a fraction of forecast error into account for the next period forecast?

a) simple average method
b) moving average method
c) weighted moving average method
d) exponential smoothing method

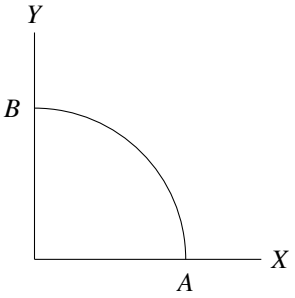
9) An analytic function of a complex variable $z = x + iy$ is expressed as $f(z) = u(x, y) + iv(x, y)$ where $i = \sqrt{-1}$. If $u = xy$, the expression for v should be

a) $\frac{(x+y)^2}{2} + k$ b) $\frac{x^2-y^2}{2} + k$ c) $\frac{y^2-x^2}{2} + k$ d) $\frac{(x-y)^2}{2} + k$

10) The solution of $x\frac{dy}{dx} + y = x^4$ with the condition $y(1) = \frac{6}{5}$ is

a) $y = \frac{x^4}{5} + 1$ b) $y = \frac{4x^4}{5} + \frac{4}{5x}$ c) $y = \frac{x^4}{5} + 1$ d) $y = \frac{x^5}{5} + 1$

11) A path AB in the form of one quarter of a circle of unit radius is shown in the figure. Integration of $(x + y)^2$ on path AB traversed in a counter-clockwise sense is



a) $\frac{\pi}{2} - 1$ b) $\frac{\pi}{2} + 1$ c) $\frac{\pi}{2}$ d) 1

12) The distance between the origin and the point nearest to it on the surface $z^2 = 1 + xy$ is

a) 1 b) $\frac{\sqrt{3}}{2}$ c) $\sqrt{3}$ d) 2