2015-ME-27-39

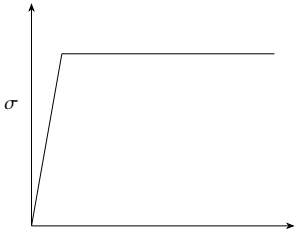
AI24BTECH11002 - K. Akshay Teja

1) Consider a steel (Young's modulus E = 200 GPa) column hinged on both sides. Its height is 1.0 m and cross-section is 10 mm $\times$ 20 mm. The lowest Euler critical buckling load (in N) is
2) A swimmer can swim 10 km in 2 hours when swimming along the flow of a river. While swimming against the flow, she takes 5 hours for the same distance. Her speed in still water (in km/h) is
3) Which one of the following is the most conservative fatigue failure criterion?

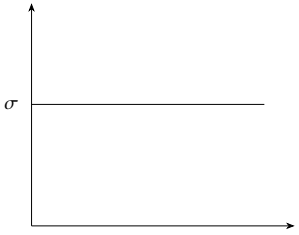
a) Soderberg b) Modified Goodman c) ASME Elliptic d) Gerber

4) Which one of the following types of stress-strain relationship best describes the behaviour of brittle materials, such as ceramics and thermosetting plastics, (σ = stress and ε = strain)?

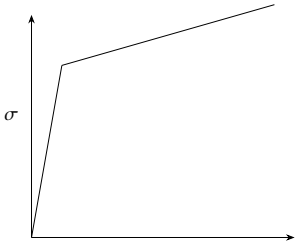
a)



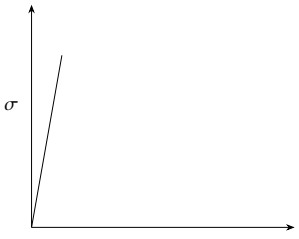
c)



b)



d)



5) Match the following products with preferred manufacturing processes:

Product		Process	
P.	Rails	1.	Blow molding
Q.	Engine crankshaft	2.	Extrusion
R.	Aluminium channels	3.	Forging
S.	PET water bottles	4.	Rolling

a) P-4, Q-3, R-1, S-2 b) P-4, Q-3, R-2, S-1 c) P-2, Q-4, R-3, S-1 d) P-3, Q-4, R-2, S-1

6) Holes of diameter $25.0^{+0.040}_{-0.020}$ mm are assembled interchangeably with the pins of diameter $25.0^{+0.005}_{-0.008}$ mm. The minimum clearance in the assembly will be

a) 0.048 mm b) 0.015 mm c) 0.005 mm d) 0.008 mm

7) Under certain cutting conditions, doubling the cutting speed reduces the tool life to $\left(\frac{1}{16}\right)^{th}$ of the original. Taylor's tool life index (n) for this tool-workpiece combination will be

8) In a linear arc welding process, the heat input per unit length is inversely proportional to

a) welding current
b) welding voltage
c) welding speed
d) duty cycle of the power source

9) The function of interpolator in a CNC machine controller is to

a) control spindle speed
b) coordinate feed rates of axes
c) control tool rapid approach speed
d) perform Miscellaneous (M) functions (tool change, coolant control etc.)

10) Consider a spatial curve in three-dimensional space given in parametric form by

$$x(t) = \cos t,\ y(t) = \sin t,\ z(t) = \frac{2}{\pi}t,\ 0 \le t \le \frac{\pi}{2}$$

The length of the curve is

11) Consider an ant crawling along the curve $(x-2)^2 + y^2 = 4$, where x and y are in meters. The ant starts at the point $(4, 0)$ and moves counter-clockwise with a speed of 1.57 meters per second. The time taken by the ant to reach the point $(2, 2)$ is (in seconds)

12) Find the solution of $\frac{d^2y}{dx^2} = y$ which passes through the origin and the point $\left(\ln 2, \frac{3}{4}\right)$

a) $y = \frac{1}{2}e^x - e^{-x}$ b) $y = \frac{1}{2}(e^x + e^{-x})$ c) $y = \frac{1}{2}(e^x - e^{-x})$ d) $y = \frac{1}{2}e^x + e^{-x}$

13) The probability of obtaining at least two "SIX" in throwing a fair dice 4 times is

a) $\frac{425}{432}$ b) $\frac{19}{144}$ c) $\frac{13}{144}$ d) $\frac{125}{432}$