

2012-ME-1-13

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I. Q.1-Q.25 CARRY ONE MARK EACH.

- 1) In abrasive jet machining, as the distance between the nozzle tip and the work surface increases, the material removal rate (2012-ME)

- a) increases continuously  
b) decreases continuously  
c) decreases, becomes stable and then increases  
d) increases, becomes stable and then decreases

- 2) Match the following metal forming processes with their associated stresses in the workpiece (2012-ME)

| <b>Metal Forming Process</b> | <b>Type of Stress</b>      |
|------------------------------|----------------------------|
| 1. Coining                   | S. Compressive             |
| 2. Wire Drawing              | P. Tensile                 |
| 3. Blanking                  | Q. Shear                   |
| 4. Deep Drawing              | R. Tensile and Compressive |

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

- 3) In an interchangeable assembly, shafts of size  $25.000^{+0.040}_{-0.010}$  mm mate with holes of size  $25.000^{+0.030}_{+0.020}$  mm. The maximum interference (in microns) in the assembly is (2012-ME)

- a) 40                      b) 30                      c) 20                      d) 10

- 4) During *normalizing* process of steel, the specimen is heated (2012-ME)

- between the upper and lower critical temperature and cooled in still air.
- above the upper critical temperature and cooled in furnace.
- above the upper critical temperature and cooled in still air
- between the upper and lower critical temperature and cooled in furnace.

- 5) Oil flows through a 200 mm diameter horizontal cast iron pipe (friction factor,  $f = 0.0225$ ) of length 500 m. The volumetric flow rate is  $0.2 \text{ m}^3/\text{s}$ . The head loss (in m) due to friction is (assume  $g = 9.81 \text{ m/s}^2$ ) (2012-ME)

- a) 116.18                      b) 0.116                      c) 18.22                      d) 232.36

- 6) For an opaque surface, the absorptivity( $\alpha$ ), transmissivity( $\tau$ ) and reflectivity( $\rho$ ) are related by the equation (2012-ME)

- a)  $\rho + \alpha = \tau$       b)  $\rho + \alpha + \tau = 0$       c)  $\rho + \alpha = 1$       d)  $\rho + \alpha = 0$

- 7) Steam enters an adiabatic turbine operating at steady state with an enthalpy of  $3251.0 \text{ kJ/kg}$  and leaves as a saturated mixture at  $15 \text{ kPa}$  with quality (dryness fraction)  $0.9$ . The enthalpies of the saturated liquid and vapor at  $15 \text{ kPa}$  are  $h_f = 225.94 \text{ kJ/kg}$  and  $h_g = 2598.3 \text{ kJ/kg}$  respectively. The mass flow rate of steam is  $10 \text{ kg/s}$ . Kinetic and potential energy changes are negligible. The power output of the turbine in  $\text{MW}$  is (2012-ME)

- a) 6.5                      b) 8.9                      c) 9.1                      d) 27.0

8) The following are the data for two crossed helical gears used for speed reduction:

Gear I : Pitch circle diameter in the plane of rotation 80 *mm* and helix angle  $30^\circ$

Gear II : Pitch circle diameter in the plane of rotation 120 *mm* and helix angle  $22.5^\circ$

If the input speed is 1440 rpm, the output speed in rpm is (2012-ME)

- a) 1200                      b) 900                      c) 875                      d) 720

9) A solid disc of radius  $r$  rolls without slipping on a horizontal floor with angular velocity  $\omega$  and angular acceleration  $\alpha$ . The magnitude of the acceleration of the point of contact on the disc is (2012-ME)

- a) zero                      b)  $r\alpha$                       c)  $\sqrt{(r\alpha)^2 + (r(\omega)^2)^2}$                       d)  $r\omega^2$

10) A thin walled spherical shell is subjected to an internal pressure. If the radius of the shell is increased by 1% and the thickness is reduced by 1%, with the internal pressure remaining the same, the percentage change in the circumferential (hoop) stress is (2012-ME)

- a) 0                      b) 1                      c) 1.08                      d) 2.02

11) The area enclosed between the straight line  $y = x$  and the parabola  $y = x^2$  in the x-y plane is (2012-ME)

- a)  $\frac{1}{6}$                       b)  $\frac{1}{4}$                       c)  $\frac{1}{3}$                       d)  $\frac{1}{2}$

12) Consider the function  $f(x) = |x|$  in the interval  $-1 \leq x \leq 1$ . At the point  $x = 0$ ,  $f(x)$  is (2012-ME)

- a) continuous and differentiable.                      c) continuous and non-differentiable.  
b) non-continuous and differentiable.                      d) neither continuous nor differentiable.

13) Which one of the following is **NOT** a decision taken during the aggregate production planning stage? (2012-ME)

- a) Scheduling of machines                      c) Rate at which production should happen  
b) Amount of labour to be committed                      d) Inventory to be carried forward