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)

Metal Forming Process	Type of Stress
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)
a) between the upper and lower critical temperature and cooled in still air.
b) above the upper critical temperature and cooled in furnace.
c) above the upper critical temperature and cooled in still air
d) 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 m^3/s. The head loss (in m) due to friction is (assume $g = 9.81\ m/s^2$) (2012-ME)

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

6) For an opaque surface, the absorptivity(α), transmissivity(τ) and reflectivity(ρ)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 kJ/kg and leaves as a saturated mixture at 15 kPa with quality (dryness fraction) 0.9. The enthalpies of the saturated liquid and vapor at 15 kPa are $h_f = 225.94\ kJ/kg$ and $h_g = 2598.3\ kJ/kg$ respectively. The mass flow rate of steam is 10 kg/s. Kinetic and potential energy changes are negligible. The power output of the turbine in 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°
Gear II : Pitch circle diameter in the plane of rotation 120 *mm* and helix angle 22.5°
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 ω and angular acceleration α. 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 $-1 \leq x \geq 1$. At the point $x = 0, f(x)$ is (2012-ME)

a) continuous and differentiable.
b) non-continuous and differentiable.
c) continuous and non-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
b) Amount of labour to be committed
c) Rate at which production should happen
d) Inventory to be carried forward