2013-ME-14-26

EE24BTECH11001 - ADITYA TRIPATHY

14. In simple exponential smoothing forecasting, to give higher weightage to recent demand information, the smoothing coefficient must be close to (2013 – *ME*)

    a) -1 b) zero c) 0.5 d) 6

15. A steel bar 200*mm* in diameter is turned at a feed of 0.25mm/rev with a depth of cut of 4*mm*. The rotational speed of the workpiece is 160*rpm*. The material removal rate in mm^3/s is (2013 – *ME*)

    a) 160 b) 167.6 c) 1600 d) 1.0

16. A cube shaped casting solidifies in 5 *min*. The solidification time in *min* for a cube of the same material, which is 8 times heavier than the original casting, will be (2013 – *ME*)

    a) 10 b) 20 c) 24 d) 40

17. For a ductile material, toughness is a measure of (2013 – *ME*)

    a) resistance to scratching b) ability to absorb energy up to fracture

    c) ability to absorb energy till elastic limit d) resistance to indentation

18. In order to have maximum power from Pelton turbine, the bucket speed must be (2013 – *ME*)

    a) equal to jet speed b) equal to half the jet speed

    c) equal to twice the jet speed d) independent of the jet speed

19. Consider one-dimensional steady state heat conduction along x-axis $0 \leq x \leq L$, through a plane wall with the boundary surfaces $x = 0 \text{and} x = L$ maintained at temperatures of $0^{\circ}C$ and $100^{\circ}C$. Heat is generated uniformly throughout the wall. Choos the **CORRECT** statement. (2013 – *ME*)

    a) The direction of heat transfer will be from the surface at $100^{\circ}C$ to the surface at $0^{\circ}C$.
    b) The maximum temperature inside the wall must be greater than $100^{\circ}C$.
    c) The temperature distribution is linear within the wall.
    d) The temperature distribution is symmetric about the mid-plane of the wall.

20. A cylinder contains $5m^3$ of an ideal gas at a pressure of 1 *bar*. This gas is compressed in a reversible isothermal process till its pressure increases to 5 *bar*. The work in *kJ* required for this process is (2013 – *ME*)

    a) 804.7 b) 953.2 c) 981.7 d) 1012.2

21. A long thin walled cylindrical shell, closed at both the ends, is subjected to an internal pressures. The ratio of the hoop stress (circumferential stress) to the longitudinal stress developed in the shell is (2013 – *ME*)

a) 0.5 b) 1.0 c) 2.0 d) 4.0

22. If two nodes are observed at a frequency of $1800 rpm$ during whirling of a simply supported long slender rotating shaft, the first critical speed of the shaft in rpm is $(2013 - ME)$

a) 200 b) 450 c) 600 d) 900

23. A planar closed kinematic chain is formed with rigid links $PQ = 2.0m, QR = 3.0m, RS = 2.5m$ and $SP = 2.7m$ with all revolute joints. The link to be fixed to obtain a double rocker (rocker - rocker) mechanism is $(2013 - ME)$

a) PQ b) QR c) RS d) SP

24. Let X be a normal random variable with mean 1 and variance 4. The probability $\Pr(X < 0)$ is $(2013 - ME)$

a) 0.5 b) greater than zero and less than 0.5

c) greater than 0.5 and less than 1.0 d) 1.0

25. Choose The **CORRECT** set of functions, which are linearly dependent. $(2013 - ME)$

a) $\sin x$, $\sin^2 x$ and $\cos^2 x$ b) $\cos x$, $\sin x$ and $\tan x$

c) $\cos 2x$, $\sin^2 x$ and $\cos^2 x$ d) $\cos 2x$, $\sin x$ and $\cos x$

Q.26 to Q.55 carry two marks each.

26. The following surface integral is to be evaluated over a sphere for the given steady velocity vector field $F = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ defined with respect to a Cartesian corrdinate system having $\mathbf{i}, \mathbf{j}$and$\mathbf{k}$ as unit base vectors.

$$\iint_S \frac{1}{4} (\mathbf{F} \cdot \mathbf{n}) \, dA \tag{1}$$

where S is the sphere, $x^2 + y^2 + z^2 = 1$ and $\mathbf{n}$ is the outward unit normal vector to the sphere. The value of the surface integral is $(2013 - ME)$

a) π b) 2π c) $\frac{3\pi}{4}$ d) 4π