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Lecturer ME July 2016
(Advt. 35-2014)

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100 Questions

Que. 1 The inverse Laplace transform of $\frac{1}{(s+1)(s-2)}$ is

1. $\frac{e^{2t}+e^t}{3}$
2. $\frac{e^{2t}+e^{-t}}{3}$
3. $\frac{e^{2t}-e^{-t}}{3}$
4. $e^{-2t} - e^t$

Testbook Solution Correct Option - 3

Que. 2 The function $\phi(x_1, x_2) = -\frac{1}{2\pi} \log \sqrt{x_1^2 + x_2^2}$ is the solution of

1. Heat equation
2. Transport equation
3. Laplace equation
4. Wave equation

Testbook Solution Correct Option - 3

Que. 3 Assume that Φ is harmonic in domain D and for $x_0 \in D$, $B(x_0, r) \subseteq D$, then the average value of Φ over the boundary of $B(x_0, r)$ equals

1. $\Phi(x_0)$
2. $r\Phi(x_0)$
3. $\frac{1}{\pi r} \Phi(x)$
4. $\frac{4}{3} \pi r^3 \Phi(x)$

Testbook Solution Correct Option - 1

Que. 4 If u solves $\nabla^2 u = 0$, in $D \subseteq \mathbb{R}^n$ then,
(Here ∂D denotes the boundary of D and $\bar{D} = D \cup \partial D$)

1. $\max_{\bar{D}} u \geq \max_D u$
2. $\max_{\bar{D}} u = \max_{\partial D} u$
3. $\max_{\bar{D}} u = u(x) \forall x \in D$
4. u is constant in D

Testbook Solution Correct Option - 2

Que. 5 For each $t > 0$, if $\Phi(x, t) = \frac{1}{\sqrt{4\pi t}} e^{-x^2/4t}$ solves the heat equation, then for $t > 0$

1. $\int_{-\infty}^{\infty} \Phi(x, t) dt = 0$

2. $\int_{-\infty}^{\infty} \Phi(x, t) dt = 1$
3. $\int_{-\infty}^{\infty} \Phi(x, t) dt = \infty$
4. not defined

Testbook Solution Correct Option - 2

Que. 6 Which of the following not true?

1. If u is harmonic, then $\nabla^2 u = 0$
2. $y = f(x - ct)$ is the progressive wave-type solution of wave equation.
3. If ϕ is harmonic in $D \subseteq \mathbb{R}^2$, and $\phi(x_0) = \max_D \phi, x_0 \in D$, then ϕ is constant in D
4. If ϕ solves the initial value wave equation in one dimension, then the sum of kinetic energy and potential energy is a function of time.

Testbook Solution Correct Option - 4

Que. 7 The value of the integral $I = 2 \int_0^{\infty} \frac{\sin t}{t} dt$ is

1. $\sqrt{\pi}$
2. $\pi/2$
3. π
4. 2π

Testbook Solution Correct Option - 3

Que. 8 If $P_{3 \times 2}$, $Q_{3 \times 4}$ and $R_{3 \times 4}$ are matrices, then the product $[Q(P^T R)^{-1} Q^T]$ is

1. a matrix of order (3×4)
2. undefined matrix
3. a scalar matrix
4. matrix of order (3×3)

Testbook Solution Correct Option - 2

Que. 9 The argument of the complex number $\sqrt{-1}$ is

1. 0
2. π
3. $\frac{\pi}{2}$
4. $-\pi$

Testbook Solution Correct Option - 3

Que. 10 $f(z) = u(x, y) + iv(x, y)$ is an analytic function of complex variable $z = x + iy$. If $v = xy$ then $u(x, y)$ equals

1. $x^2 + y^2$
2. $x^2 - y^2$

3. $\frac{1}{2}(x^2 + y^2)$
4. $\frac{1}{2}(x^2 - y^2)$

Testbook Solution Correct Option - 4

Que. 11 Which of the following is not true?

1. $\log(1 + z) = z - \frac{z^2}{2} + \frac{z^3}{3} - \frac{z^4}{4} + \dots$ about $z = 0$
2. $\frac{z}{(z+1)(z+2)} = \left(\frac{1}{2} - \frac{1}{3}\right) - \left(\frac{1}{2^3} - \frac{1}{3^2}\right)(z - 2) + \left(\frac{1}{2^5} - \frac{1}{3^3}\right)(z - 2)^2 + \dots$ about $z = 2$
3. $\oint_C \frac{e^z}{(z+4)^2} dz = 0$ where C is the circle $|z-1| = 2$
4. $f(z) = \frac{(z-1)}{z(z^2-1)}$ has no singularity

Testbook Solution Correct Option - 4

Que. 12 Residue at $z = 2$ of $f(z) = \frac{2z+1}{z^2-z-2}$ is

1. $\frac{5}{3}$
2. $\frac{1}{3}$
3. $\frac{3}{5}$
4. $\frac{2}{3}$

Testbook Solution Correct Option - 1

Que. 13 The value of $\oint_C \frac{dz}{(z^2+6)}$, where C is the boundary of $|z - i| = 1$, is

1. $2\pi i$
2. $4\pi i$
3. 0
4. πi

Testbook Solution Correct Option - 3

Que. 14 The mode of the data

Marks	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25
No. of students	7	10	16	32	24

Marks	26 - 30	31 - 35	36 - 40	41 - 45
No. of students	18	10	5	1

is

1. 18
2. 32
3. 24
4. 18.83

Testbook Solution Correct Option - 1

Que. 15 For two events R and S, let $P(R) = 0.4$, $P(S) = p$ and $P(R \cup S) = 0.6$. Then p equals

1. 0.2, when R and S are independent
2. 0.2, when R and S are mutually disjoint
3. Not determined in any case
4. 0.2, when R and S are dependent

Testbook Solution Correct Option - 2

Que. 16 Eight coins are tossed 25,600 times. The average number of eight heads is

1. 1000
2. 200
3. 300
4. 100

Testbook Solution Correct Option - 4

Que. 17 If, $\frac{dy}{dx} = x + y$, $y(0) = 1$ using Runge's method the value of y at $x = 0.2$, when $h = 0.2$ is

1. 1.2
2. 1.4
3. 1
4. 1.48

Testbook Solution Correct Option - 1

Que. 18 The cubic equation $x^3 - 2x - 8 = 0$, has

1. no real roots between 3 and 4
2. a real root less than zero
3. only one real root between 1 and 2
4. two negative roots and one positive root

Testbook Solution Correct Option - 1

Que. 19 Let $I = \int_{x_0}^{x_1} f(x) dx$. Then which of the following is false?

1. $I \sim \frac{h}{2} [y_0 + y_n + \frac{1}{2}(y_1 + y_2 + \dots + y_{n-1})]$
2. $I \sim \frac{h}{3} [y_0 + y_n + 4(y_1 + y_3 + \dots + y_{n-1}) + 2(y_2 + y_4 + \dots + y_{n-2})]$, n is even
3. $I \sim h(y_0 + y_1 + y_2 + \dots + y_{n-1})$
4. $I \sim \frac{h}{140} (41y_0 + 216y_1 + 27y_2 + 272y_3 + 27y_4 + 216y_5 + 41y_6)$

Testbook Solution Correct Option - 1

Que. 20 The table below gives the values of f(x) for different values of x:

x	0	0.25	0.5	0.75	1
---	---	------	-----	------	---

$$\begin{array}{|c|c|c|c|c|c|} \hline f(x) & 1 & 0.9682 & 0.8660 & 0.6614 & 0 \\ \hline \end{array}$$

The value of, $I = \int_0^1 f(x) dx$ using Simpson's rule is

1. 0.866
2. 0.749
3. 0.7709
4. 0.73

Testbook Solution Correct Option - 3

Que. 21 For any square matrix P, defined matrices $Q = P + P^T$, $R = P - P^T$, then

1. both Q and R are anti-symmetric
2. R is anti-symmetric and Q is symmetric
3. both are symmetric
4. None of the above is true

Testbook Solution Correct Option - 2

Que. 22 r_1, r_2, \dots, r_N form an orthonormal set of non-zero vectors. The vector space spanned by $r_1, r_2, \dots, -r_{N-1}, -r_N$ will be of dimension

1. N
2. N + 1
3. N - 1
4. N - 2

Testbook Solution Correct Option - 2

Que. 23 The system of equations

$$x + 2y + z = 0$$

$$x - z = 0$$

$$x + y = 0$$

has

1. a trivial solution only
2. no solution
3. infinitely many solutions
4. non-trivial unique solution

Testbook Solution Correct Option - 3

Que. 24 For the matrix $X = \begin{bmatrix} 1 & -1 & 1 \\ 0 & -1 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ the eigenvector corresponding to the eigenvalue -1 is

1. (2, 1, 1)
2. (1, -1, 1)
3. (0, 0, 0)

4. (1, 2, 0)

Testbook Solution Correct Option - 4

Que. 25 $\lim_{x \rightarrow 0} \frac{\cos x - 1}{\sin x - x}$ is equal to

1. Undefined
2. ∞
3. 1
4. 0

Testbook Solution Correct Option - 2

Que. 26 The function $f(x) = 3 + |x - 2|$ at the point (2, 3) is

1. not continuous
2. continuous and differentiable
3. not differentiable and not continuous
4. not differentiable but continuous

Testbook Solution Correct Option - 4

Que. 27 The function $f(x) = \frac{\tan x}{x}$ at $x = 0$ has

1. a discontinuity
2. a maximum
3. a minimum
4. a point of inflection

Testbook Solution Correct Option - 4

Que. 28 The series expansion of $\frac{\sin x}{x}$ near origin is

1. $1 + \frac{x^3}{3!} + \dots$
2. $1 - \frac{x^3}{3!} + \dots$
3. $1 - \frac{x^2}{6} + \dots$
4. $x - \frac{x^3}{3!} + \dots$

Testbook Solution Correct Option - 3

Que. 29 For $i = \sqrt{-1}$, the value of the integral $I = \int_0^{\pi/2} \frac{\cos 3x + i \sin 3x}{\sin 2x + i \cos 2x} dx$ is

1. $\frac{-1}{5}(-1 + i)$
2. $\frac{1}{5}(1 + i)$
3. $\frac{1}{5}(-1 - i)$
4. $\sqrt{\pi}/5$

Testbook Solution Correct Option - 1

Que. 30 The value of the integral $I = \int_0^1 x^2 e^x dx$ is

1. $x e^x$
2. $4e - 2$
3. $e - 2$
4. $e + 4$

Testbook Solution Correct Option - 3

Que. 31 The velocity vector field $\vec{q} = (x - y)\hat{i} + (y - x)\hat{j} + (x + y + z)\hat{k}$ is

1. irrotational
2. rotational
3. of potential kind
4. solenoidal

Testbook Solution Correct Option - 2

Que. 32 If $\oint_C \vec{F} \cdot d\vec{l}$, then which of the following is equal to I?

1. $\iiint_V (\nabla \times \vec{F}) \cdot d\vec{V}$
2. $\iint_S (\nabla \times \vec{F}) \cdot d\vec{S}$
3. $\iint_S \vec{F} \cdot \hat{n} dS$
4. $\iiint_V \vec{F} \cdot \hat{n} dV$

Testbook Solution Correct Option - 2

Que. 33 Let $I = \oint_C (x^2 y dy - y^2 x dx)$, where C is the boundary of square $0 \leq x \leq 1, 0 \leq y \leq 1$. Then I equals

1. $\frac{1}{4}$
2. 4
3. 1
4. 2

Testbook Solution Correct Option - 3

Que. 34 At point (1, 0, 3) on the surface $2x^2 + 3y^2 + z^2 - 11 = 0$, the directional derivative in the direction $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ is

1. 10
2. $\frac{5}{3}$
3. $-\frac{5}{3}$
4. $\frac{10}{\sqrt{6}}$

Testbook Solution Correct Option - 4

Que. 35 The degree and the order of the differential equation

$$\frac{d^4y}{dx^4} = 2\left(\frac{d^3y}{dx^3} + \frac{1}{dy}\right)^{\frac{1}{2}} = (y)^{\frac{1}{2}}$$

1. 4 and 4
2. 4 and 2
3. 2 and 4
4. 1 and 4

Testbook Solution Correct Option - 1

Que. 36 The partial differential equation $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = (z^2 + x^2)$

1. semilinear
2. quasilinear
3. linear and homogenous
4. non-linear and homogenous

Testbook Solution Correct Option - 3

Que. 37 The differential equation $x \frac{dy}{dx} - 2y = 2, y(0) = -2$ has which of the following solution?

1. $y = x^2 - 2$
2. $y = Cx^2 - 2$
3. $y = x - 2$
4. No solution

Testbook Solution Correct Option - 4

Que. 38 Assume $\frac{\partial u}{\partial t} + b_1 \frac{\partial u}{\partial x} + b_2 \frac{\partial u}{\partial y} = 0$ in $\mathbb{R}^2 \times (0, \infty)$, $u = g(x, y)$ on $\mathbb{R}^2 \times \{t = 0\}$. Then u equals

1. $g(x, y, t)$
2. $g(x - tb_1, y - tb_2)$
3. $g(x - t, y - t)$
4. None of the above

Testbook Solution Correct Option - 3

Que. 39 The solution of the differential equation $2 \frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$

1. $y = C_1 \cos 3x + C_2 \sin 2x$
2. $y = C_1 e^{2x} + C_2 e^{-2x}$
3. $y = C_1 \cos \frac{3}{2}x + C_2 \sin 2x$
4. $y = C_1 e^{-\frac{3}{2}x} + C_2 e^{2x}$

Testbook Solution Correct Option - 4

Que. 40 Which of the following represents the Laplace transform of $\sin(at)$?

1. $\frac{a}{s+a}$
2. $\frac{a}{s-a}$
3. $\frac{a}{s^2+a^2}$
4. $\frac{a}{s^2-a^2}$

Testbook Solution Correct Option - 3

Que. 41 In a parson's reaction turbine, when α_1 is the angle with the direction of motion of the blade at which steams enters the blade, then the maximum efficiency of the turbine is given by

1. $\frac{2 \cos \alpha_1}{1 + \cos \alpha_1}$
2. $\frac{2 \cos^2 \alpha_1}{1 + \cos^2 \alpha_1}$
3. $\frac{2 \cos^2 \alpha_1}{1 - \cos \alpha_1}$
4. $\frac{2 \cos^2 \alpha_1}{1 + 2 \cos^2 \alpha_1}$

Testbook Solution Correct Option - 2

Que. 42 An indication of auto-ignition quality of a diesel fuel is given by

1. octane number
2. detonation
3. preignition
4. cetane number

Testbook Solution Correct Option - 4

Que. 43 The effect of blade friction in a steam turbine is

1. reheat the gas
2. increase the specific output
3. reduce the exhaust pressure
4. reduce work done

Testbook Solution Correct Option - 4

Que. 44 In a gas turbine power plant, reheating of gases between high pressure and low pressure turbine stages will

1. Improve turbine output
2. Decrease turbine output
3. Increase compressor work
4. Decrease compressor work

Testbook Solution Correct Option - 1

Que. 45 For a jet propulsion unit, ideally, the compressor work and turbine work are

1. unequal
2. equal

3. not related to each other
4. None of the above

Testbook Solution Correct Option - 2

Que. 46 For applied load P kg, diameter of ball D mm and diameter of indentation d mm, the Brinell hardness number is given by

1. $B_{HN} = \frac{P}{\frac{\pi}{2}(D - \sqrt{D^2 - d^2})}$
2. $B_{HN} = \frac{D}{\frac{\pi}{2}(D - \sqrt{D^2 - d^2})}$
3. $B_{HN} = \frac{PD}{\frac{\pi}{2}(D - \sqrt{D^2 - d^2})}$
4. $B_{HN} = \frac{P}{(\frac{\pi D}{2})(D - \sqrt{D^2 - d^2})}$

Testbook Solution Correct Option - 4

Que. 47 Age hardening is generally applicable to

1. cast iron
2. medium carbon steel
3. high alloy steel
4. alloys of aluminium, magnesium, nickel etc

Testbook Solution Correct Option - 4

Que. 48 If steel is cooled in still air, the structure obtained is

1. pearlite
2. sorbite
3. troosite
4. acicular

Testbook Solution Correct Option - 2

Que. 49 When V is the volume and A is the surface area of the casting, then according to Chvorinov's equation, solidification time of a casting is proportional to

1. $\left\{ \frac{V}{A} \right\}$
2. $\left\{ \frac{V}{A} \right\}^2$
3. $\left\{ \frac{V}{A} \right\}^3$
4. $\left\{ \frac{V}{A} \right\}^4$

Testbook Solution Correct Option - 2

Que. 50 Refractoriness in the moulding sand is due to the presence of

1. clay

2. silica
3. additives and binders
4. dust

Testbook Solution Correct Option - 2

Que. 51 Which of the following operations is known as 'sweating'?

1. Tinning two surfaces to be joined, applying flux and heating
2. Heating two surfaces to be joined, to the high temperature in presence of flux
3. Heating two surfaces at low temperature
4. Joining of two surfaces without use of flux

Testbook Solution Correct Option - 2

Que. 52 In MIG welding at high current, the metal is transferred into the form of which of the following?

1. A fine spray of metal
2. Molten drops
3. Weld pool
4. Molecules

Testbook Solution Correct Option - 1

Que. 53 Which of the following relationship between shear angle ϕ , friction angle β and cutting rake angle α is known as Lee and Shaffer analysis

1. $2\phi + \beta - \alpha = \frac{\pi}{2}$
2. $\phi + \beta - \alpha = \frac{\pi}{2}$
3. $\phi + \beta - \alpha = \frac{\pi}{4}$
4. $\phi + \frac{\beta}{2} - \frac{\alpha}{2} = \frac{\pi}{2}$

Testbook Solution Correct Option - 3

Que. 54 Merchant's machinability constant is

1. $\phi + \beta - \alpha$
2. $2\phi - \beta + \alpha$
3. $2\phi + \beta - \alpha$
4. $2\phi - \beta - \alpha$

Testbook Solution Correct Option - 3

Que. 55 The relation for cutting tool life is given as $VT^n = c$, where V is cutting speed, T is corresponding life, n and c are constants depending on cutting conditions. The numerical value of n for roughing cut as compared to that for light cuts in mild steel would be

1. more
2. less
3. same
4. Does not depend on type of cut

Testbook Solution Correct Option - 1

Que. 56 LVDT converts

1. Linear displacements into electrical signal
2. Pressure into electrical output
3. Strain into electrical output
4. None of the above

Testbook Solution Correct Option - 1

Que. 57 APT is used

1. in teaching of the beginners
2. in CAM for NC machine tools
3. in inventory management
4. None of the above

Testbook Solution Correct Option - 2

Que. 58 CAE and CAM are linked through

1. a common database and communication system
2. NC-type programming and automated design
3. assembly automation and tool production
4. parts production and testing

Testbook Solution Correct Option - 1

Que. 59 Flexible manufacturing allows for

1. automated design
2. factor management
3. tool design and tool production
4. quick and inexpensive product changes

Testbook Solution Correct Option - 4

Que. 60 The use of CPM lies in

1. taking corrective measures
2. scheduling and controlling the project
3. planning and controlling the most logical sequence of operations
4. None of the above

Testbook Solution Correct Option - 3

Que. 61 In India, the work for standardization of production has been mainly done by

1. IPC
2. SI
3. ISI

4. UPSC

Testbook Solution Correct Option - 3

Que. 62 Jobs going behind the schedule are conveniently shown in

1. Milestone chart
2. Pie chart
3. Bar chart
4. Gantt chart

Testbook Solution Correct Option - 4

Que. 63 A competitive firm will maximize profit at the output, where

1. the difference between price and marginal cost is the highest.
2. the difference between marginal revenue and price is highest.
3. the price is higher than the average total cost by the largest possible amount.
4. the excess of total revenue over the total cost is greatest.

Testbook Solution Correct Option - 4

Que. 64 For which of the following situations, linear programming can be applied?

1. Material selection problems
2. Product design problems
3. Scheduling of production to meet sales forecast
4. Quenching problems

Testbook Solution Correct Option - 1

Que. 65 Monte Carlo simulation of queues is used when

1. arrival time distributions are standard
2. service time distributions are standard
3. mathematical analysis cannot be adopted
4. None of the above

Testbook Solution Correct Option - 3

Que. 66 Analysis is an operation, when carried out in terms of individual motions of a worker is known as

1. work analysis
2. motion analysis
3. operation analysis
4. None of the above

Testbook Solution Correct Option - 2

Que. 67 CPM is a technique based on

1. event
2. event and activity

3. neither event nor activity
4. activity

Testbook Solution Correct Option - 4

Que. 68 Optimum reorder quantity is

1. $\sqrt{\frac{2(\text{annual unit usage}) \times (\text{cost per set-up or order})}{(\text{cost per unit}) \times (\text{percent annual carrying cost})}}$
2. $\sqrt{\frac{2(\text{cost of item})}{(\text{annual usage}) \times (\text{percent annual carrying cost})}}$
3. $\sqrt{\frac{2(\text{cost per unit}) \times (\text{percent annual carrying cost})}{(\text{annual unit storage}) \times (\text{cost per set-up or order})}}$
4. $\sqrt{\frac{2(\text{cost per unit}) \times (\text{annual carrying cost})}{(\text{cost per set-up or order}) \times (\text{percent annual carrying cost})}}$

Testbook Solution Correct Option - 1

Que. 69 The constraints in a given situation are found to be as follows:

$$0 \leq x \leq 12$$

$$0 \leq y \leq 9$$

$$3x + 6y \leq 66$$

The objective function which is to be maximised is as follows:

$$P = 5x + 4y$$

The value of x and y are

1. 11, 6
2. 6, 11
3. 5, 12
4. 12, 5

Testbook Solution Correct Option - 4

Que. 70 If a flywheel has a mass moment of inertia I, rotating at a mean speed ω , kinetic energy is E and coefficient of fluctuation of speed is K, then maximum fluctuation of energy in a flywheel will be equal to

1. $I\omega^2K$
2. $2KE$
3. $I\omega(\omega_1 - \omega_2)$
4. All of the above

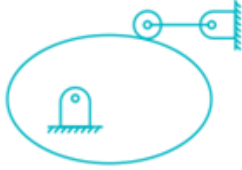
Testbook Solution Correct Option - 4

Que. 71 The pressure angle and the base circle in a cam should be

1. both as big as possible
2. respectively as low as possible and as big as possible
3. respectively as big as possible and as low as possible
4. both as low as possible

Testbook Solution Correct Option - 2

Que. 72 The degree of freedom of the mechanism shown in the figure is



1. two
2. zero
3. one
4. negative one

Testbook Solution Correct Option - 3

Que. 73 If t and T are the number of teeth on pinion and gear, G is gear ratio, A_p is the fraction by which the standard addendum of one module is multiplied and ϕ is the pressure angle, the expression of the minimum number of teeth on the pinion to avoid interference when pinion and gear have an equal number of teeth is given as

1. $t = \frac{2A_p}{\sqrt{1-3 \sin^2 \phi} + 1}$
2. $t = \frac{2A_p}{\sqrt{1+3 \sin^2 \phi} + 1}$
3. $t = \frac{2A_p}{\sqrt{1-3 \sin^2 \phi} - 1}$
4. $t = \frac{2A_p}{\sqrt{1+3 \sin^2 \phi} - 1}$

Testbook Solution Correct Option - 4

Que. 74 A block of volume $V \text{ mm}^3$ is subjected to hydrostatic pressure $p \text{ MPa}$. Modulus of elasticity is $E \text{ GPa}$ and Poisson's ratio $\nu = 0.5$. Which statement is true about the block?

1. Bulk modulus $K = \infty$, perfectly incompressible and change in volume is zero.
2. Bulk modulus $K = 1$, perfectly incompressible and change in volume is zero.
3. Bulk modulus $K = 0$, perfectly incompressible and change in volume is ∞ .
4. Bulk modulus $K = \infty$, perfectly compressible and change in volume is zero.

Testbook Solution Correct Option - 1

Que. 75 A solid steel shaft of 100 mm diameter and 1.0 m long is subjected to a twisting moment T . This shaft is to be replaced by a hollow shaft having outer and inner diameters as 100 mm and 50 mm respectively. If the maximum shear stress induced in both the shafts is same, the twisting moment T transmitted by hollow shaft must be reduced by

1. $T/4$
2. $T/8$
3. $T/16$
4. $T/12$

Testbook Solution Correct Option - 3

Que. 76 If one end of a hinged column is made fixed and other end free, how much is the critical load compared to the original value?

1. Four times
2. One-fourth
3. One-half
4. Twice

Testbook Solution Correct Option - 2

Que. 77 The state of stress at a point is given as $\sigma_x = 100 \text{ N/mm}^2$, $\sigma_y = 40 \text{ N/mm}^2$ and $\tau_{xy} = 40 \text{ N/mm}^2$. If the yield strength S_y of the material is 300 MPa, the factor of safety using maximum shear stress theory will be

1. 3
2. 2.5
3. 7.5
4. 1.25

Testbook Solution Correct Option - 2

Que. 78 A shaft can safely transmit 90 kW while rotating at a given speed. If this shaft is replaced by a shaft of diameter double of the previous one and rotated at half the speed of the previous, the power that can be transmitted by the new shaft is:

1. 90 kW
2. 180 kW
3. 360 kW
4. 720 kW

Testbook Solution Correct Option - 3

Que. 79 Mohr's circle construction is valid for both stresses as well as the area moment of inertia, because

1. both are tensors of first-order
2. both are tensors of second-order
3. both are axial vectors
4. both occur under plane stress condition

Testbook Solution Correct Option - 2

Que. 80 In the CGS unit, dynamic viscosity is expressed as

1. poise
2. Pa-s
3. stokes
4. None of the above

Testbook Solution Correct Option - 1

Que. 81 A ladder is resting on a smooth ground and leaning against a rough vertical wall. The force of friction will act

1. towards the wall at its upper end
2. away from the wall at its upper end
3. downward at its upper end
4. upward at its upper end

Testbook Solution Correct Option - 4

Que. 82 If ω is the angular speed of rotation and g is acceleration due to gravity, the height h of a watt governor is expressed as

1. $h = \frac{g}{\omega^2}$
2. $h = \omega g$
3. $h = \omega^2 g$
4. $h = \frac{g}{\omega}$

Testbook Solution Correct Option - 1

Que. 83 A helical coil spring with wire diameter d and mean coil diameter D is subjected to axial load. A constant ratio of D and d has to be maintained, such that the extension of the spring is independent of D and d . What is the ratio?

1. $\frac{D^3}{d^4}$
2. $\frac{d^3}{D^4}$
3. $\frac{D^4}{d^3}$
4. $\frac{d^4}{D^3}$

Testbook Solution Correct Option - 1

Que. 84 Bearing characteristics number in a hydrodynamic bearing depends upon

1. viscosity, speed and bearing pressure
2. viscosity, speed and load
3. load, speed and length
4. length, width and speed

Testbook Solution Correct Option - 1

Que. 85 To replace a pipe of diameter D by n parallel pipes of diameter d , the formula used is

1. $d = D/n$
2. $d = D/n^{1/2}$
3. $d = D/n^{3/2}$
4. $d = D/n^{2/5}$

Testbook Solution Correct Option - 4

Que. 86 Bernoulli's theorem deals with the conservation of

1. Mass
2. Force
3. Momentum
4. Energy

Testbook Solution Correct Option - 4

Que. 87 The power transmitted through a pipe is maximum when the loss of head due to friction is given by (H = head supplied)

1. H/4
2. H/3
3. H/2
4. 2H/3

Testbook Solution Correct Option - 2

Que. 88 The thermal diffusivity of a substance is given by

1. $\frac{k\rho}{c}$
2. $\frac{k}{\rho c}$
3. $\frac{kc}{\rho}$
4. $\frac{\rho c}{k}$

Testbook Solution Correct Option - 2

Que. 89 If R_1 and R_2 are the inner and outer radii of a cylinder, the heat conduction through a cylinder is proportional to

1. $(R_1 - R_2)$
2. $(R_1 \times R_2)$
3. $\frac{1}{(R_1 - R_2)}$
4. $\frac{1}{\log_e \left\{ \frac{R_1}{R_2} \right\}}$

Testbook Solution Correct Option - 4

Que. 90 If ε is the emissivity of surfaces and shields and n is the number of shields, introduced between the two surfaces, then overall emissivity is given by

1. $\frac{1}{n\varepsilon}$
2. $\frac{1}{n(2-\varepsilon)}$
3. $\frac{1}{(n+1)(2-\varepsilon)}$
4. $\frac{\varepsilon}{(n+1)(2-\varepsilon)}$

Testbook Solution Correct Option - 4

Que. 91 If one of the two fluids flowing through a heat exchanger of NTU = 2 remains at constant temperature throughout the exchanger length, the effectiveness of the heat exchanger will be

1. $1 - e^{-4}$
2. $1 - e^{-2}$
3. $\frac{1 - e^{-2}}{2}$
4. $\frac{1 - e^2}{2}$

Testbook Solution Correct Option - 2

Que. 92 $\frac{\text{Nusselt number}}{\text{Reynold's number} \times \text{Prandtl number}}$

1. Weber number
2. Stanton number
3. Biot number
4. Mach number

Testbook Solution Correct Option - 2

Que. 93 A reversible polytropic process is given by

1. $\frac{T_1}{T_2} = \left\{ \frac{\rho_1}{\rho_2} \right\}^n$
2. $\frac{P_1}{P_2} = \left\{ \frac{\rho_1}{\rho_2} \right\}^n$
3. $\frac{T_1}{T_2} = \left\{ \frac{P_1}{P_2} \right\}^{n-1}$
4. $\frac{T_1}{T_2} = \left\{ \frac{\rho_1}{\rho_2} \right\}^{\frac{n-1}{n}}$

Testbook Solution Correct Option - 2

Que. 94 The characteristic equation of gases $PV = nRT$ holds good for

1. mono-atomic gases
2. diatomic gases
3. real gases
4. ideal gases

Testbook Solution Correct Option - 4

Que. 95 Critical to Stagnation Pressure ratio $\left(\frac{P^*}{P_0} \right)$ for an expansion process is

1. $\frac{P^*}{P_0} = \left[\frac{2}{\gamma+1} \right]^{\frac{2\gamma}{(\gamma-1)}}$
2. $\frac{P^*}{P_0} = \left[\frac{2}{\gamma+1} \right]^{\frac{(\gamma+1)}{(\gamma-1)}}$
3. $\frac{P^*}{P_0} = \left[\frac{2}{\gamma+1} \right]^{\frac{\gamma}{(\gamma+1)}}$
4. $\frac{P^*}{P_0} = \left[\frac{2}{\gamma+1} \right]^{\frac{\gamma}{(\gamma-1)}}$

Testbook Solution Correct Option - 4

Que. 96 An open system

1. is a specified region where transfers of energy and/or mass take place
2. is a region of constant mass and only energy is allowed to cross the boundaries
3. cannot transfer either energy or mass to or from the surroundings
4. has an enthalpy transfer across its boundaries and the mass within the system is not necessarily

Testbook Solution Correct Option - 1

Que. 97 The equation $\left\{P + \frac{a}{V^2}\right\} (V - b) = RT$ is known as

1. Perfect gas equation
2. Maxwell's equation
3. Kinetic theory of gases equation
4. Van-der Waals equation

Testbook Solution Correct Option - 4

Que. 98 The performance of a reciprocating compressor is expressed by

1. $\frac{\text{isothermal work}}{\text{indicated work}}$
2. $\frac{\text{adiabatic work}}{\text{indicated work}}$
3. $\frac{\text{isothermal work}}{\text{adiabatic work}}$
4. $\frac{\text{adiabatic work}}{\text{frictionless work}}$

Testbook Solution Correct Option - 1

Que. 99 The work done in compressing 1 kg of air in compression will be least when the value of the index is

1. 1
2. 1.1
3. 1.2
4. 1.41

Testbook Solution Correct Option - 1

Que. 100 SIMO charts are used in:

1. Method study
2. Micro motion study
3. Process analysis
4. Time study

Testbook Solution Correct Option - 2