TEST PAPER 6

Total Questions: 60 **Time allotted 75 minutes**

Q.1) $\int \frac{dx}{1+e^{-x}}$ is equal to

(a) $1+e^{x}+c$ (b) $\frac{1}{2}\log\left(1+e^{x}\right)+c$

(c) $\log\left(1+e^{x}\right)+c$ (d) $2\log\left(1+e^{x}\right)+c$

Q.2) $\int_{0}^{\pi/2} e^{\sin x}\cos x\ dx$ is equal to

(a) $e + 1$ (b) $e - 1$

(c) $e + 2$ (d) e

Q.3) The area bounded by the coordinate axes and the curve $\sqrt{x}+\sqrt{y}=1$ is equal to

(a) 1 (b) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) $\frac{1}{6}$

Q.4) The value of $\int_{0}^{\pi/2} \log\left(\tan x\right)dx$ is equal to

(a) $\frac{\pi}{2}$ (b) 0

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{8}$

Q.5) The degree of the differential equation $\frac{dy}{dx}-x=\left(y-x\frac{dy}{dx}\right)^{-4}$ is

(a) 2 (b) 3

(c) 4 (d) 5

Q.6) y – A cos ωt + B sin ωt is a solution of the differential equation

(a) $\frac{d^2y}{dt^2}-\omega^2 y=0$ (b) $\frac{d^2y}{dt^2}-\omega y=0$

(c) $\frac{d^2y}{dt^2}+\omega y=0$ (d) $\frac{d^2y}{dt^2}+\omega^2 y=0$

Q.7) The differential equation $3\frac{dy}{dx}+\frac{3y}{x}=2x^4y^4$ is not linear. The integrating factor to solve this equation is

(a) $\frac{1}{x^2}$ (b) $\frac{1}{x^3}$

(c) $\frac{1}{x^4}$ (d) x^4

Q.8) The general solution of $\frac{dy}{dx}+y=\sin x$ is

(a) $y=ce^{-2x}+\frac{1}{4}\sin x-\frac{1}{2}\cos x$ (b) $y=ce^{-x}+\frac{1}{2}\sin x-\frac{1}{2}\cos x$

(c) $y=ce^{-3x}+\sin x$ (d) $y=ce^{-x}$

Q.9) The solution of $\frac{dy}{dx}=\sqrt{1-x^2-y^2+x^2y^2}$ is

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

(c) $\sin^{-1}y=\frac{1}{2}x\sqrt{1-x^2}+\frac{1}{2}\sin^{-1}x+c$ (d) $\sin^{-1}y=\frac{1}{2}x\sqrt{1-x^2}+\frac{1}{4}\cos^{-1}x+c$

Q.10) Which one of the following pairs is not correctly matched?

Differential Equations		Their Solutions
(a) $\frac{dy}{dx}+P(x)y=0$	…	$y=ce^{\int P\,dx}$
(b) $\frac{x\,dy-y\,dx}{x^2+y^2}+ax\,dx=0$	…	$\tan^{-1}\left(\frac{y}{x}\right)+a\frac{x^2}{2}=c$
(c) $\frac{x\,dy-y\,dx}{x^2-y^2}=0$	…	$\log(x+y)+c$
(d) $y\,dx+x\,dy=0$	…	$xy=c$

Q.11) The differential of the system of circles touching the y-axis at the origin, is given by

(a) $x^2+y^2-2xy\frac{dy}{dx}=0$ (b) $x^2+y^2+2xy\frac{dy}{dx}=0$

(c) $x^2-y^2+2xy\frac{dy}{dx}=0$ (d) $x^2-y^2-2xy\frac{dy}{dx}=0$

Q.12) The rate at which bacteria multiply is proportional to the instantaneous number present. If the original number doubles in 2 hours, then they will triple in

(a) $4\frac{\log 2}{\log 3}hours$ (b) $5\frac{\log 2}{\log 3}hours$

(c) $2\frac{\log 2}{\log 3}hours$ (d) $\frac{\log 2}{\log 3}hours$

Q.13) If $\vec{b}$ is a unit vector in the *xy*-plane making an angle of $\frac{\pi}{4}$ with the *x*-axis, then $\vec{b}$ is equal to

(a) $\hat{i}+\hat{j}$ (b) $\hat{i}-\hat{j}$

(c) $(\hat{i}+\hat{j})/\sqrt{2}$ (d) $(\hat{i}-\hat{j})/\sqrt{2}$

Q.14) Distance between two points whose position vectors are $3\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+5\hat{k}$ is

(a) 69 units (b) $\sqrt{69}$ units

(c) 13 units (d) 29 units

Q.15) If $\vec{A}\neq\vec{O}$ and both the conditions

(i) $\vec{A}.\vec{B} = \vec{A}.\vec{C}$ and (ii) $\vec{A}\times\vec{B} = \vec{A}\times\vec{C}$ hold simultaneously, then

(a) $\vec{B} = \vec{C} = \vec{O}$ (b) $\vec{B} = \vec{C}$

(c) $\vec{B} \neq \vec{C}$ (d) $\vec{B} \neq \vec{O}, \vec{C} \neq \vec{O}$

Q.16) α, β, ξ, η are non-empty sets then

(a) $(\alpha\times\beta)\cup(\xi\times\eta) = (\alpha\times\beta)\cap(\xi\times\eta)$

(b) $(\alpha\times\beta)\cap(\xi\times\eta) = (\alpha\times\xi)\cap(\beta\times\eta)$

(c) $(\alpha\cap\beta)\times(\xi\cap\eta) = (\alpha\times\xi)\cup(\beta\times\eta)$

(d) $(\alpha\cap\beta)\times(\xi\cap\eta) = (\alpha\times\eta)\cup(\beta\times\xi)$

Q.17) There are 600 students in a school, If 400 of them can speak Telugu, 300 can speak Hindi, then the number of students who can speak both Telugu and Hindi are

(a) 100 (b) 200

(c) 300 (d) 400

Q.18) In a Euclidean plane, which one of the following is *not* an equivalence relation?

(a) Parallelism of lines (a line being deemed parallel to itself)

(b) Congruence of triangles

(c) Similarity of triangles

(d) Orthogonality of lines

Q.19) The modulus and principle amplitude of $\left(1+i\sqrt{3}\right)^2$, respectively are

(a) $2, -\frac{\pi}{2}$ (b) $4, \frac{2\pi}{3}$

(c) $\frac{5}{8}, \tan^{-1}\left(-\frac{4}{3}\right)$ (d) $4, -\frac{3\pi}{4}$

Q.20) If 1, ω, ω^2 are the cube roots of unity, then value of $(x+y)^2$ to $\left(x\omega + y\omega^2\right)^2 + \left(x\omega^2 + y\omega\right)^2$ is equal to

(a) *xy* (b) 3*xy*

(c) 6*xy* (d) 9*xy*

Q.21) The value of $\left[\frac{-1+i\sqrt{3}}{2}\right]^{3n} + \left[\frac{-1-i\sqrt{3}}{2}\right]^{3n}$ is equal to

(a) 3 (b) 3/2

(c) 0 (d) 2

Q.22) The complex number z, satisfying the equation $\left|\frac{i-z}{i+z}\right| = 1$ lies on

(a) a circle with the centre (0, 0) and radius 1

(b) the *x*-axis

(c) the *y*-axis

(d) the line $y = x + 1$

Q.23) The binary number 1101101 + 1011011 is written in decimal system as

(a) 198 (b) 199

(c) 200 (d) 201

Q.24) The binary equivalent to the decimal number 0.3125

(a) 0101 (b) .1010

(c) .0101 (d) .1101

Q.25) The binary number 10110100001 in decimal system is

(a) 441 (b) 1441

(c) 1241 (d) 241

Q.26) The the *m*th and the *n*th terms of an H.P. are *n* and *m* respectively, then the *mn*th term is

(a) 0 (b) 1

(c) 2 (d) $\frac{1}{2}$

Q.27) If *a, b, c* are in G.P., then $\frac{1}{a^2-b^2}+\frac{1}{b^2}$ is

(a) $\frac{1}{c^2-b^2}$ (b) $\frac{1}{b^2-c^2}$

(c) $\frac{1}{c^2-a^2}$ (d) $\frac{1}{b^2-a^2}$

Q.28) The value of $3-1+\frac{1}{3}-\frac{1}{9}=...$ is equal to

(a) $\frac{20}{9}$ (b) $\frac{9}{20}$

(c) $\frac{9}{4}$ (d) $\frac{4}{9}$

Q.29) If $(x-2)(x+6)\geq 0$, then the solution set is

(a) $(x : x \geq 2)$ (b) $(x : x \leq 6)$

(c) $(x : x \leq -6)$ (d) $(x : x \geq 2 \text{ or } x \leq -6)$

Q.30) The value of $\sqrt{6+\sqrt{6+\sqrt{6+...}}}$ is equal to

(a) 2 (b) 3

(c) $\sqrt{6}$ (d) 6

Q.31) If the equations $x^2 - px + q = 0$ and $x^2 + qx - p = 0$ have a common root, then which one of the following will hold true?

(a) $p = q$ (b) $p + q = 2$

(c) $p + q = 1$ (d) $p - q = 1$

Q.32) The number of words that can be formed from the letters of the word INDRAPRASTHA when the vowels are never separated is

(a) 727560 (b) 725760

(c) 752760 (d) 757260

Q.33) The number of 2-digit even numbers that can be formed from the digits 1, 2, 3, 4 and 5, repetition being not allowed, is

(a) 2^5 (b) 5!

(c)16 (d) 8

Q.34) The number of ways in which 6 people can be seated at a round table is

(a) 6 (b) 60

(c) 120 (d) 720

Q.35) The coefficient of the middle term in the expansion of $(2+3x)^4$ is

(a) 6 (b) 5!

(c) 8! (d) 216

Q.36) If in the binomial expansion of $(1 + x)^n$ when n is a natural number, the coefficients of the 5^{th}, 6^{th} and 7^{th} terms are in A.P., then n is equal to

(a) 7 or 13 (b) 7 or 14

(c) 7 or 15 (d) 7 or 17

Q.37) If $\log_8 m + \log_g \frac{1}{6} = \frac{2}{3}$, then m is equal to

(a) 24 (b) 18

(c) 12 (d) 4

Q.38) If $a^x = b^y = c^z$, and $\log_b a = \log_c b$, then which one of the following will hold true?

(a) $y^2 = xz$ (b) $x^2 = yz$

(c) $z^2 = xy$ (d) $y = xz$

Q.39) If $\left(x + \frac{1}{x}\right) = 3$, then $\left(x^6 + \frac{1}{x^6}\right)$ is equal to

(a) 927 (b) 414

(c) 364 (d) 322

Q.40) The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ is equal to

(a) 1 (b) 2

(c) 3 (d) 4

Q.41) If $A = \begin{bmatrix} 2 & -1 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ -1 & -1 \end{bmatrix}$, the $(A+B)^2$ is *not* equal to

(a) $A^2 + AB + BA + B^2$ (b) $A^2 + 2AB + B^2$

(c) $A^2 + AB + BA + B^2 I$ (d) $A^2 I + AB + BA + B^2$

Q.42) If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} = (\alpha 1 + \beta A)^2$, then the value of α and β are given by

(a) $\alpha = \frac{1}{\sqrt{2}}, \beta = \frac{1}{\sqrt{2}}$ (b) $\alpha = \frac{-1}{\sqrt{2}}, \beta = \frac{1}{\sqrt{2}}$

(c) $\alpha = \beta = \pm\frac{1}{\sqrt{2}}$ (d) $\alpha = -\beta = \pm\frac{1}{\sqrt{2}}$

Q.43) If A be an $n \times n$ matrix and C any scalar, then | CA |

(a) $n^C |A|$ (b) $C^n |A|$

(c) $nC|A|$ (d) $C|A|$

Q.44) The matrix $\begin{bmatrix} 0 & 7 & 4 \\ -7 & 0 & -5 \\ -4 & 5 & 0 \end{bmatrix}$ is

(a) symmetric (b) skew symmetric
(c) non-singular (d) orthogonal

Q.45) If $x = \begin{bmatrix} x & -3i & 1 \\ y & 1 & i \\ 0 & 2i & -i \end{bmatrix} = 6 + 11i$, then

(a) $x = -3, y = 4$ (b) $x = 3, y = 4$
(c) $x = 3, y = -4$ (d) $x = -3, y = -4$

Q.46) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then A^{-1} is equal to

(a) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 1 \\ -\frac{3}{2} & \frac{1}{2} \end{bmatrix}$
(c) $\begin{bmatrix} -2 & -1 \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}$ (d) $\begin{bmatrix} 2 & -1 \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}$

Q.47) The expansion of the determinant $\begin{vmatrix} x & y & 3 \\ x^2 & 5y^3 & 9 \\ x^3 & 10y^5 & 27 \end{vmatrix}$ contains which one of the following as a factor?

(a) $x - 3$ (b) $x - y$
(c) $y - 3$ (d) $(x-3)(y-3)$

Q.48) The value of the determinant $\begin{vmatrix} a & h & g & f \\ 0 & b & c & e \\ 0 & 0 & d & k \\ 0 & 0 & 0 & l \end{vmatrix}$ is

(a) *gfkl* (b) *abhg*
(c) *abdl* (d) *ablc*

Q.49) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, then

(a) both AB and BA exist
(b) neither AB nor BA exists
(c) AB exists but BA does not exists
(d) AB does not exist but BA exist

Q.50) The solution of equations $3x + y + 2z = 3; 2x - 3y - z = -3$ and $x + 2y + z = 4$ is

(a) $x = 3, y = 2, z = -2$ (b) $x = 2, y = 1, z = 3$

(c) $x=1, y=2, z=-1$ (d) $x=1, y=2, z=1$

Q.51) The adjoint of $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ (b) $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

(c) $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ (d) $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

Q.52) The number of sides of two regular polygons are in the ratio 5 : 4. The difference between their angles is 9^0. Which one of the following is correct?
(a) One of them is a pentagon and the other is a rectangle.
(b) One of them must be a hexagon.
(c) One of them is an octagon.
(d) One of the has 20 sides and the other has 16 sides.

Q.53) The value of $\tan 31^o.\tan 32^o.\tan 32^o.\tan 33^o...\tan 59^o$ is equal to
(a) -1 (b) 0
(c) 1 (d) 2

Q.54) The number $\left(\frac{-11\pi}{6}\right), \tan\left(\frac{21\pi}{4}\right)$ and $\cot\left(\frac{283\pi}{6}\right)$ are in
(a) A.P. (b) G.P.
(c) H.P. (d) none of the above

Q.55) The correct value of the parameter '*t*' of the identity $2\left(\sin^6 x+\cos^6 x\right)+t\left(\sin^4 x+\cos^4 x\right)=-1$ is
(a) 0 (b) -1
(c) -2 (d) -3

Q.56) If $w=x+y+z$, then $\sin x+\sin y+\sin z-\sin\omega$ is equal to

(a) $4\sin\frac{y+z}{2}\sin\frac{z+x}{2}\sin\frac{x+y}{2}$ (b) $4\cos\frac{y+z}{2}\cos\frac{z+x}{2}\cos\frac{x+y}{2}$

(c) $4\tan\frac{y+z}{2}\tan\frac{z+x}{2}\tan\frac{x+y}{2}$ (d) $4\cot\frac{y+z}{2}\cot\frac{z+x}{2}\cot\frac{x+y}{2}$

Q.57) To derive the tangent formula, the following steps are given:

1. $\tan(A+B)=\dfrac{\frac{\sin A\cos B}{\cos A\cos B}+\frac{\cos A\sin B}{\cos A\cos B}}{\frac{\cos A\cos B}{\cos A\cos B}+\frac{\sin A\sin B}{\cos A\cos B}}$

2. $\tan(A+B)=\dfrac{\sin(A+B)}{\cos(A+B)}$

3. $\tan(A+B)=\dfrac{\sin A\cos B+\cos A\sin B}{\cos A\cos B-\sin A\sin B}$

4. $\tan(A+B)=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$

Their correct and proper sequential form to derive the formula is
(a) 2, 4, 3, 1 (b) 1, 2, 3, 4

(c) 1, 4, 2, 3 (d) 2, 3, 1, 4

Q.58) Consider the following:

1. If $\cot\theta - x$, then $x + \frac{1}{x} = \sec\theta \operatorname{cosec}\theta$.

2. If $x + \frac{1}{x} = \sin\theta$, then $x^2 + \frac{1}{x^2} = \sin^2\theta - 2$

3. If $x = p\sec\theta$ and $y = q\tan\theta$, then $x^2q^2 - y^2p^2 = p^2q^2$.

4. The maximum value of $\cos\theta - \sqrt{3}\sin\theta$ is 3.

Which of these are correct?

(a) 1 and 2 (b) 2 and 3

(c) 3 and 4 (d) 1, 2 and 3

Q.59) If $x + \frac{1}{x} = 2\cos\theta$, then $x^3 + \frac{1}{x^3}$ is equal to

(a) $\frac{1}{2}\cos\theta$ (b) $\cos\theta$

(c) $2\cos 3\theta$ (d) $3\cos 3\theta$

Q.60) The expression $3\{\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi - \alpha)\} - 2\{\sin^6\left(\frac{\pi}{2} - \alpha\right) + \sin^6(5\pi - \alpha)$ is equal to

(a) $\sin 2\alpha + \sin 3\alpha$ (b) 3

(c) 1 (d) 0

ANSWER KEYS

1.	(c)	13.	(c)	25.	(b)	37.	(a)	49.	(c)
2.	(b)	14.	(b)	26.	(b)	38.	(a)	50.	(c)
3.	(d)	15.	(b)	27.	(b)	39.	(d)	51.	(a)
4.	(b)	16.	(d)	28.	(c)	40.	(c)	52.	(c)
5.	(d)	17.	(a)	29.	(a)	41.	(b)	53.	(c)
6.	(d)	18.	(d)	30.	(b)	42.	(c)	54.	(b)
7.	(b)	19.	(b)	31.	(d)	43.	(d)	55.	(d)
8.	(b)	20.	(c)	32.	(b)	44.	(b)	56.	(a)
9.	(c)	21.	(d)	33.	(d)	45.	(a)	57.	(d)
10.	(c)	22.	(b)	34.	(c)	46.	(a)	58.	(d)
11.	(d)	23.	(c)	35.	(d)	47.	(a)	59.	(c)
12.	(c)	24.	(c)	36.	(b)	48.	(c)	60.	(c)