1. If $2^x + 2^y = 2^{x+y}$, then $\frac{dy}{dx}$ is

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

Sol: $\frac{dy}{dx} = \frac{2^x\left(1-2^y\right)}{2^y\left(2^x-1\right)}$

$= \frac{2^x-\left(2^x-2^y\right)}{2^x+2^y-2^y}$

$= -2^{y-x}$

Ans: (b)

2. If $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $f'\left(\sqrt{3}\right)$ is

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $-\frac{1}{\sqrt{3}}$

Sol: $f(x) = 2\tan^{-1}x$

$f'(x) = \frac{2}{1+x^2}$

$f'\left(\sqrt{3}\right) = \frac{2}{4} = \frac{1}{2}$

Ans: (b)

3. The right hand and left hand limit of the function $f(x) = \begin{cases} \frac{e^{1/x}-1}{e^{1/x}+1}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$ are respectively

(a) 1 and 1 (b) 1 and -1 (c) -1 and -1 (d) -1 and 1

Sol: $\underset{x\to 0^+}{Lt} f(x) = \underset{h\to 0}{Lt} \frac{e^{1/h}-1}{e^{1/h}+1}$

$= \underset{h\to 0}{Lt} \frac{1-e^{-1/h}}{1+e^{-1/h}} = 1$

$\underset{h\to 0^-}{Lt} f(x) = \underset{h\to 0}{Lt} \frac{e^{-1/h}-1}{e^{-1/h}+1} = \frac{0-1}{0+1} = -1$

Ans: (b)

4. If $y = 2x^{n+1} + \frac{3}{x^n}$, then $x^2\frac{d^2y}{dx^2}$ is

(a) $6n(n+1)y$ (b) $n(n+1)y$ (c) $x\frac{dy}{dx}+y$ (d) y

Sol: $\frac{dy}{dx}=2(n+1)x^n-\frac{3n}{x^{n+1}}$

$\frac{d^2y}{dx^2}=2n(n+1)x^{n-1}+\frac{3n(n+1)}{x^{n+2}}$

$\frac{x^2d^2y}{dx^2}=n(n+1)\left[2x^{n+1}+\frac{3}{x^n}\right]=n(n+1)y$

Ans: (b)

5. If the curves $2x=y^2$ and $2xy=K$ intersect perpendicularly, then the value of K^2 is

(a) 4 (b) $2\sqrt{2}$ (c) 2 (d) 8

Sol: $2x=y^2$, $2xy=k$

$\frac{dy}{dx}=\frac{1}{y},\ \frac{dy}{dx}=\frac{-y}{x}$

$m_1m_2=-1$

$\frac{1}{y}\times\frac{y}{n}=-1$

$X=1$

$\therefore\ y^2=2$

$4x^2y^2=k^2$

$k^2=4(1)(2)$

$k^2=8$

Ans: (d)

6. If $(xe)^y=e^y$, then $\frac{dy}{dx}$ is

(a) $\frac{\log x}{(1+\log x)^2}$ (b) $\frac{1}{(1+\log x)^2}$ (c) $\frac{\log x}{(1+\log x)}$ (d) $\frac{e^x}{x(y-1)}$

Sol: $(xe)^y=e^x$

Take log on both sides

$y(1+\log x)=x$

$y=\frac{x}{1+\log x}$

$\frac{dy}{dx}=\frac{\log x}{(1+\log x)^2}$

Ans: (a)

7. If the side of a cube is increased by 5%, then the surface area of a cube is increased by

(a) 10% (b) 60% (c) 6% (d) 20%

Sol: $\frac{\delta x}{x} \times 100 = 5\%$

$\frac{\delta S}{S} \times 100 = \frac{12x}{6x^2} = \delta x \times 100$

$= 2 \times \frac{\delta x}{x} \times 100$

$= 2 \times 5 = 10\%$

Ans: (a)

8. The value of $\int \frac{1+x^4}{1+x^6} dx$ is

(a) $\tan^{-1} x + \tan^{-1} x^3 + C$ (b) $\tan^{-1} x + \frac{1}{3}\tan^{-1} x^3 + C$

(c) $\tan^{-1} x - \frac{1}{3}\tan^{-1} x^3 + C$ (d) $\tan^{-1} x + \frac{1}{3}\tan^{-1} x^2 + C$

Sol: $\int \frac{\left(x^4 - x^2 + 1\right) + x^2}{\left(x^2+1\right)\left(x^4 - x^2 + 1\right)} dx$

$= \int \frac{1}{x^2+1} dx + \frac{1}{3}\int \frac{3x^2}{x^6+1} dx$

Let $x^3 = t,\ 3x^2 dx = dt$

$= \tan^{-1} x + \frac{1}{3}\tan^{-1}\left(x^3\right) + c$

Ans: (b)

9. The maximum value of $\frac{\log_e x}{x}$, if $x > 0$ is

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

Sol: $f'(x) = \frac{1 - \log x}{x^2}$

$f'(x) = 0$

$x = e$

$f''(e) < 0$

$\therefore$ on maximum value $= \frac{1}{e}$

Ans: (c)

10. The value of $\int e^{\sin x}\sin 2x dx$ is

(a) $2e^{\sin x}(\sin x-1)+C$ (b) $2e^{\sin x}(\sin x+1)+C$

(c) $2e^{\sin x}(\cos x+1)+C$ (d) $2e^{\sin x}(\cos x-1)+C$

Sol: Let $\sin x = t$

$\cos x\ dx = dt$

$2\int e^t t\,dt = 2e^t[t-1]+c$

$= 2e^{\sin x}[\sin x-1]+c$

Ans: (a)

11. The value of $\int_{-1/2}^{1/2}\cos^{-1}x\,dx$ is

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

Sol: $I=\int_{-1/2}^{1/2}\cos^{-1}(x)dx$ … (1)

$I=\int_{-1/2}^{1/2}\cos^{-1}(-x)dx$

$I=\int_{-1/2}^{1/2}\pi-\cos^{-1}x\ dx$ … (2)

(1) + (2)

$2I=\int_{-1/2}^{1/2}\pi\,dx$

$2I=\pi(1)$

$I=\frac{\pi}{2}$

Ans: (b)

12. If $\int\frac{3x+1}{(x-1)(x-2)(x-3)}dx = A\log|x-1|+B\log|x-2|+C\log|x-3|+C$, then the values of A, B and C are respectively

(a) $5,-7,-5$ (b) $2,-7,-5$ (c) $5,-7,5$ (d) $2,-7,5$

Sol: $\frac{3x+1}{(x-1)(x-2)(x-3)}=\frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x-3}$

$3x+1=A(x-2)(x-3)+B(x-1)(x-3)+C(x-1)(x-2)$

Taking $x = 1, 2, 3$

$A = 2, B = -7, C = 5$

Ans: (d)

13. The value of $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ is

(a) $\frac{\pi}{2}\log 2$ (b) $\frac{\pi}{4}\log 2$ (c) $\frac{1}{2}$ (d) $\frac{\pi}{8}\log 2$

Sol: Let $x = \tan\theta$

$dx = \sec^2|\theta d\theta$

$$I = \int_0^{\pi/4} \frac{\log(1+\tan\theta)}{\sec^2\theta} \times \sec^2\theta d\theta$$

$$I = \int_0^{\pi/4} \log(1+\tan\theta) d\theta \qquad \ldots (1)$$

$$I = \int_0^{\pi/4} \log\left(1+\tan\left(\frac{\pi}{4}-\theta\right)\right) d\theta$$

$$= \int_0^{\pi/4} \log\left(\frac{2}{1+\tan\theta}\right) d\theta$$

$$I = \log 2 \int_0^{\pi/4} 1\, d\theta - I$$

$$2I = \log 2 \cdot \frac{\pi}{4}$$

$$I = \frac{\pi}{8}\log 2$$

Ans: (d)

14. The area of the region bounded by the curve $y^2 = 8x$ and the line $y = 2x$ is

(a) $\frac{16}{3}$ sq.units (b) $\frac{4}{3}$ sq.units (c) $\frac{3}{4}$ sq.units (d) $\frac{8}{3}$ sq.units

Sol: $A = \int_0^2 \left(2\sqrt{2}\sqrt{x} - 2x\right) dx$

$$= \left(\frac{4\sqrt{2}}{3} x^{3/2} - x^2\right) = \left(\frac{4\,2^{1/2}}{3} 2^{3/2} - 4\right) = \frac{4}{3}$$

Ans: (b)

15. The value of $\int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx$ is

(a) 2 (b) 0 (c) 1 (d) –2

Sol: $I = \int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx$ … (1)

$I = \int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^{-x}} dx$

$I = \int_{-\pi/2}^{\pi/2} \frac{e^x(\cos x)}{1+e^x} dx$ … (2)

(1) + (2)

$2I = \int_{-\pi/2}^{\pi/2} \cos x \, dx$

$= (\sin x)_{-\pi/2}^{\pi/2}$

$2I = 2$

$I = 1$

Ans: (c)

16. The order of the differential equation obtained by eliminating arbitrary constants in the family of curves $c_1 y = (c_2 + c_3)e^{x+c_4}$ is

(a) 1 (b) 2 (c) 3 (d) 4

Sol: $c_1 y = k_1 e^x \cdot e^{cy}$

$y = \frac{k_1 e^{cy}}{c_1} e^x$

$y = ke^x$

order $=1$

Ans: (a)

17. The general solution of the differential equation $x^2 dy - 2xy dx = x^4 \cos x \, dx$ is

(a) $y = x^2 \sin x + cx^2$ (b) $y = x^2 \sin x + c$ (c) $y = \sin x + cx^2$ (d) $y = \cos x + cx^2$

Sol: $\frac{dy}{dx} - \frac{2}{x} y = x^2 \cos x$

$\text{I.F} = e^{\int \frac{-2}{x} dx} = \frac{1}{x^2}$

G.S $y \cdot \frac{1}{x^2} = \int \frac{1}{x^2}\left(x^2 \cos x\right) dx$

$\frac{y}{x^2} = \sin x + c$

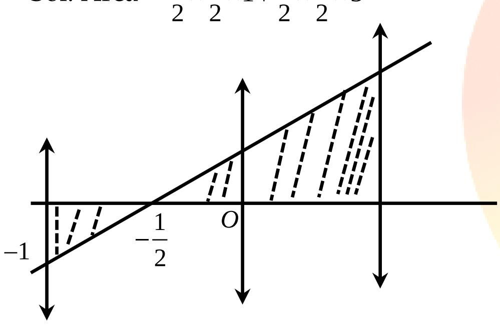
$y = x^2 \sin x + cx^2$

Ans: (a)

18. The area of the region bounded by the line $y = 2x+1$, $x-$axis and the ordinates $x=-1$ and $x=1$ is

(a) $\frac{9}{4}$ (b) 2 (c) $\frac{5}{2}$ (d) 5

Sol: Area $= \frac{1}{2} \times \frac{1}{2} \times 1 + \frac{1}{2} \times \frac{3}{2} \times 3$



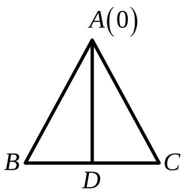
$= \frac{1}{4} + \frac{9}{4} = \frac{5}{2}$

Ans: (c)

19. The two vectors $\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}+3\hat{j}+5\hat{k}$ represent the two sides $\overrightarrow{AB}$ and $\overrightarrow{AC}$ respectively of a ΔABC. The length of the median through A is

(a) $\frac{\sqrt{14}}{2}$ (b) 14 (c) 7 (d) $\sqrt{14}$

Sol: Consider A as origin



$\overrightarrow{AD} = \frac{\overrightarrow{AB}+\overrightarrow{AC}}{2} = \hat{i}+2\hat{j}+3\hat{k}$

Length of $AD = \sqrt{1+4+9} = \sqrt{14}$

Ans: (d)

20. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between $\vec{a}$ and $\vec{b}$, then $\sin\frac{\theta}{2}$ is

(a) $|\vec{a}+\vec{b}|$ (b) $\frac{|\vec{a}+\vec{b}|}{2}$ (c) $\frac{|\vec{a}-\vec{b}|}{2}$ (d) $|\vec{a}-\vec{b}|$

Sol: $|\vec{a}-\vec{b}| = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a}\cdot\vec{b}$

$= 1+1-2\cos\theta$

$= 2(1-\cos\theta)$

$|\vec{a}-\vec{b}|^2 = 2\cdot 2\sin^2\left(\frac{\theta}{2}\right)$

$|\vec{a}-\vec{b}| = 2\sin\left(\frac{\theta}{2}\right)$

Ans: (c)

21. The curve passing through the point $(1, 2)$ given that the slope of the tangent at any point (x, y) is $\frac{3x}{y}$ represents

(a) Circle (b) Parabola (c) Ellipse (d) Hyperbola

Sol: $\frac{dy}{dx} = \frac{2x}{y}$

$ydy = 2xdx$

$\frac{y^2}{2} = x^2 + c$ passes through $(1, 2)$

$C = 1$

$\therefore \frac{y^2}{2} = x^2 + 1$

$\frac{x^2}{1} - \frac{y^2}{2} = -1$

Represents hyperbola

Ans: (d)

22. If $|\vec{a}\times\vec{b}|^2 + |\vec{a}\cdot\vec{b}|^2 = 144$ and $|\vec{a}| = 6$ then $|\vec{b}|$ is equal to

(a) 6 (b) 3 (c) 2 (d) 4

Sol: $|\vec{a}|^2|\vec{b}|^2 = 144$

$|\vec{b}|^2 = 4$

$|\vec{b}| = 2$

Ans: (c)

23. The point $(1, -3, 4)$ lies in the octant

(a) Second (b) Third (c) Fourth (d) Eighth

Sol: Fourth octant

Ans: (c)

24. If the vectors $2\hat{i}-3\hat{j}+4\hat{k}$, $2\hat{i}+\hat{j}-\hat{k}$ and $\lambda\hat{i}-\hat{j}+2\hat{k}$ are coplanar, then the value of λ is

(a) 6 (b) -5 (c) -6 (d) 5

Sol: $\begin{vmatrix} 2 & -3 & 4 \\ 2 & 1 & -1 \\ \lambda & -1 & 2 \end{vmatrix} = 0$

$2(2-1)+3(4+\lambda)+4(-2-\lambda)=0$

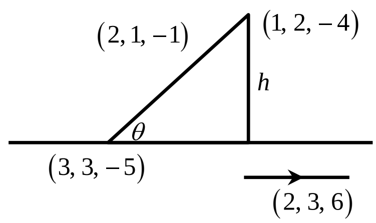
$\lambda = 6$

Ans: (a)

25. The distance of the point $(1, 2, -4)$ from the line $\frac{x-3}{2}=\frac{y-3}{3}=\frac{z+5}{6}$ is

(a) $\frac{293}{7}$ (b) $\frac{\sqrt{293}}{7}$ (c) $\frac{293}{49}$ (d) $\frac{\sqrt{293}}{49}$

Sol: $\cos\theta = \frac{4+3-6}{\sqrt{6}.\times 7} = \frac{1}{7\sqrt{6}}$



$\sin\theta = \frac{h}{\sqrt{6}}$

$h = \sqrt{6}\sqrt{1-\cos^2\theta} = \frac{\sqrt{293}}{7}$

Ans: (b)

26. The sine of the angle between the straight line $\frac{x-2}{3}=\frac{3-y}{-4}=\frac{z-4}{5}$ and the plane $2x-2y+z=5$ is

(a) $\frac{3}{\sqrt{50}}$ (b) $\frac{3}{50}$ (c) $\frac{4}{5\sqrt{2}}$ (d) $\frac{\sqrt{2}}{10}$

Ans: (g)

Sol: $\vec{b}(3, -4, 5), \vec{n}=(2, -2, 1)$

$\sin\theta = \frac{\vec{b}\cdot\vec{n}}{|\vec{b}||\vec{n}|} = \frac{1}{\sqrt{50}}$

27. If a line makes an angle of $\frac{\pi}{3}$ with each of x and $y-$axis, then the acute angle made by $z-$axis is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

Sol: $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

$\frac{1}{4}+\frac{1}{4}+\cos^2\gamma=1$

$\cos^2\gamma=1-\frac{1}{2} \quad =\frac{1}{2}$

$\cos\gamma=\frac{1}{\sqrt{2}}$

$\gamma=\frac{\pi}{4}$

Ans: (a)

28. Corner points of the feasible region determined by the system of linear constraints are $(0,3),(1,1)$ and $(3,0)$. Let $z=px+qy$, where $p,q>0$. Condition on p and q so that the minimum of z occurs at $(3,0)$ and $(1,1)$ is

(a) $p=2q$ (b) $p=\frac{q}{2}$ (c) $p=3q$ (d) $p=q$

Sol: $z=px+qy$

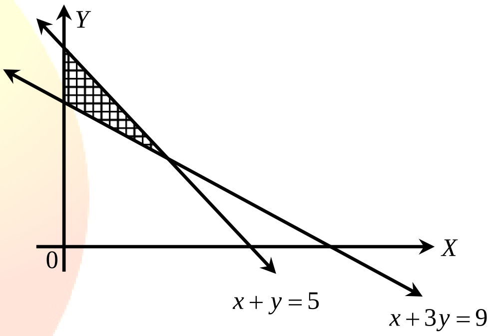
Z occurs maximum at $(3,0),(1,1)$

$3p=p+q$

$2p=q$

Ans: (b)

29. The feasible region of an LPP is shown in the figure. If $Z=11x+7y$, then the maximum value of Z occurs at



(a) $(0,5)$

(b) $(3,3)$

(c) $(5,0)$

(d) $(3,2)$

Sol: Corner points $(0,3),(0,5),(3,2)$

$\therefore$ maximum value at $(3,2)$

Ans: (d)

30. A die is thrown 10 times, the probability that an odd number will come up atleast one time is

(a) $\frac{1}{1024}$ (b) $\frac{1023}{1024}$ (c) $\frac{11}{1024}$ (d) $\frac{1013}{1024}$

Sol: $n=10,\ p=\frac{3}{6}=\frac{1}{2},\ q=\frac{1}{2}$

$p(x\geq 1)=1-p(x=0)$

$$=1-\left[10C_0\left(\frac{1}{2}\right)^{10}\right]=1-\frac{1}{2^{10}}$$

$$=1-\frac{1}{1024}=\frac{1023}{1024}$$

Ans: (b)

31. If A and B are two events such that $P(A)=\frac{1}{3}, P(B)=\frac{1}{2}$ and $P(A\cap B)=\frac{1}{6}$, then $P\left(\frac{A'}{B}\right)$ is

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{12}$

Sol: $P\left(\frac{A'}{B}\right)=\frac{P(A'\cap B)}{P(B)}$

$$=\frac{P(B)-P(A\cap B)}{P(B)}$$

$$=\left(\frac{1}{2}-\frac{1}{6}\right)2$$

$$=2\left[\frac{3-1}{6}\right]=\frac{2}{3}$$

Ans: (a)

32. Events E_1 and E_2 from a partition of the sample space S . A is any event such that

$P(E_1)=P(E_2)=\frac{1}{2}, P\left(\frac{E_2}{A}\right)=\frac{1}{2}$ and $P\left(\frac{A}{E_2}\right)=\frac{2}{3}$, then $P\left(\frac{E_1}{A}\right)$ is

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

Sol: $\frac{P(E_2\cap A)}{P(A)}=\frac{1}{2}, \frac{P(A\cap E_2)}{P(E_2)}=\frac{2}{3}$

$$P(A)=\frac{2}{3}, P(A\cap E_2)=\frac{1}{3}$$

$$A\cap(E_1\cup E_2)=A$$

$$P(A\cap E_1)+P(A\cap E_2)=P(A)$$

$$P(A\cap E_1)=\frac{1}{3}$$

$$P\left(\frac{E_1}{A}\right)=\frac{P(E_1\cap A)}{P(A)}=\frac{\frac{1}{3}}{\frac{2}{3}}=\frac{1}{2}$$

Ans: (a)

33. The probability of solving a problem by three persons A, B and C independently is $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{3}$ respectively. Then the probability of the problem is solved by any two of them is

(a) $\frac{1}{12}$ (b) $\frac{1}{4}$ (c) $\frac{1}{24}$ (d) $\frac{1}{8}$

Sol: $P(A)=\frac{1}{2}, P(B)=\frac{1}{4}, P(C)=\frac{1}{3}$

Probability of the problem solved by any two

$=P(A)P(B)P(\bar{C})+P(A)P(\bar{B})P(C)+P(\bar{A})P(B)P(C)$

$=\frac{1}{4}$

Ans: (b)

34. If $n(A)=2$ and total number of possible relations from set A to set B is 1024, then $n(B)$ is

(a) 512 (b) 20 (c) 10 (d) 5

Sol: $2\times p \quad 10$

$2=1024=2$

$2p=10$

$n(B)=p=5$

Ans: (d)

35. The value of $\sin^2 51°+\sin^2 39°$ is

(a) 1 (b) 0 (c) $\sin 12°$ (d) $\cos 12°$

Sol: $\sin^2 51-\cos^2 39+1$

$\cos(51+39)\cos(5)-39+1$

$\cos 90\times\cos 1241=0+=1$

Ans: (a)

36. If $\tan A+\cot A=2$, then the value of $\tan^4 A+\cot^4 A=$

(a) 2 (b) 1 (c) 4 (d) 5

Sol: $\tan A+\frac{1}{\tan A}=2$

$(\tan A-1)^2=0$

$\tan A=1,\ A=45°$

$\tan^4 45°+\cos^4\cdot 45=2$

Ans: (a)

37. If $A=\{1, 2, 3, 4, 5, 6\}$, then the number of subsets of A which contain atleast two elements is

(a) 64 (b) 63 (c) 57 (d) 58

Sol: $P(A)=2^6=64$

$P(A)-7=64-7=57$

Ans: (c)

38. If $z=x+iy$, then the equation $|z+1|=|z-1|$ represents

(a) a circle (b) a parabola (c) $x-$axis (d) $y-$axis

Sol: $(x+1)^2+y^2=(x-1)^2+y^2$

$4x=0$

$x=0,\ y-$axis

Ans: (d)

39. The value of ${}^{16}C_9+{}^{16}C_{10}-{}^{16}C_6-{}^{16}C_7$ is

(a) 0 (b) 1 (c) ${}^{17}C_{10}$ (d) ${}^{17}C_3$

Sol: ${}^{n}C_r+{}^{n}C_{r-1}={}^{(n+1)}C_r$

${}^{16}C_9+{}^{16}C_{10}-\left({}^{16}C_6+{}^{16}C_7\right)$

${}^{17}C_{10}-{}^{17}C_7$

${}^{17}C_{17-10}-{}^{17}C_7=0$ $\left(\because\ {}^{n}C_r={}^{n}C_{n-r}\right)$

Ans: (a)

40. The number of terms in the expansion of $(x+y+z)^{10}$ is

(a) 66 (b) 142 (c) 11 (d) 110

Sol: ${}^{(n+r=1)}C_{r-1}$

$n=10,\ r=3$

${}^{(10+3-1)}C_{31}={}^{12}C_2=\frac{12\times 11}{2}=66$

Ans: (a)

41. If $P(n):2^n<n!$. Then the smallest positive integer for which $P(n)$ is true if

(a) 2 (b) 3 (c) 4 (d) 5

Sol: $2^n<4!\Rightarrow 16<24$

Ans: (c)

42. The two lines $lx+my=n$ and $l'x+m'y=n'$ are perpendicular if

(a) $ll'+mm'=0$ (b) $lm'=ml'$ (c) $lm+l'm'=0$ (d) $lm'+ml'=0$

Sol: $m_1=\frac{-l}{m},\ m_2=\frac{-l}{m}$

$m_1\times m_2=-1$

$\left(\frac{-l}{m}\right)\left(\frac{-l'}{m'}\right)=-1$

$ll'+mn'=0$

Ans: (a)

43. If the parabola $x^2=4ay$ passes through the point $(2,1)$, then the length of the latus rectum is

(a) 1 (b) 4 (c) 2 (d) 8

Sol: $x^2=4ay\Rightarrow 2^2=4a\times1\Rightarrow a=1$

$4a=4\times1=4$

Ans: (b)

44. If the sum of n terms of an A.P is given by $S_n=n^2+n$, then the common difference of the A.P is

(a) 4 (b) 1 (c) 2 (d) 6

Sol: $d=S_2-2S_1$

Ans: (c)

45. The negation of the statement "For all real numbers x and y, $x+y=y+x$" is

(a) For all real numbers x and y, $x+y\neq y+x$

(b) For some real numbers x and y, $x+y=y+x$

(c) For some real numbers x and y, $x+y\neq y+x$

(d) For some real numbers x and y, $x-y=y-x$

Sol: For some real numbers x and y, $x+y\neq y+x$

Ans: (c)

46. The standard deviation of the data 6, 7, 8, 9, 10 is

(a) $\sqrt{2}$ (b) $\sqrt{10}$ (c) 2 (d) 10

Sol: 6, 7, 8, 9, 10, $\bar{x}=8,\ n=5$

$\text{S.D}=\sqrt{\frac{1}{n}\left(x_1^2\right)-x^{-2}}=\sqrt{66-64}=\sqrt{2}$

Ans: (a)

47. $\lim_{x\to 0}\left(\frac{\tan x}{\sqrt{2x+4}-2}\right)$ is equal to

(a) 2 (b) 3 (c) 4 (d) 6

Sol: $\lim_{x\to 0}\frac{\tan x\left(\sqrt{2x+4}+2\right)}{2x+4-4}$

$\lim_{x\to 0}\frac{\tan x}{x}\times\lim_{x\to 0}\frac{\left(\sqrt{2x+4}+2\right)}{2}$

$1\times\frac{2+2}{2}=2$

Ans: (a)

48. If a relation R on the set $\{1, 2, 3\}$ be defined by $R=\{(1, 1)\}$, then R is

(a) Reflexive and symmetric
(b) Reflexive and transitive
(c) Symmetric and transitive
(d) Only symmetric

Sol: Symmetric and transitive

Ans: (c)

49. Let $f:[2,\infty)\to R$ be the function defined $f(x)=x^2-4x+5$, then the range of f is

(a) $(-\infty, \infty)$ (b) $[1, \infty)$ (c) $(1, \infty)$ (d) $[5, \infty)$

Sol: $y=f(x)=x^2-4x+5=(x-2)^2+1$

$1+(x-2)^2\geq 0+1$

$y\geq 1\Rightarrow y\in[1, \infty)$

Ans: (b)

50. If A, B, C are three mutually exclusive and exhaustive events of an experiment such that $P(A)=2P(B)=3P(C)$, then $P(B)$ is equal to

(a) $\frac{1}{11}$ (b) $\frac{2}{11}$ (c) $\frac{3}{11}$ (d) $\frac{4}{11}$

Sol: $\frac{P(A)}{6}=\frac{2P(B)}{6}=\frac{3P(C)}{6}$

$\frac{P(A)}{6}=\frac{P(B)}{3}=\frac{P(C)}{2}=K$

$P(A)=6K,\ P(B)=3K,\ P(C)=2(K)$

$P(A)+P(B)+P(C)=1\Rightarrow 11K=1,\ K=\frac{1}{11}$

Ans: (c)

51. The domain of the function defined by $f(x)=\cos^{-1}\sqrt{x-1}$ is

(a) $[1, 2]$ (b) $[0, 2]$ (c) $[-1, 1]$ (d) $[0, 1]$

Sol: $0\le\sqrt{x-1}\le 1$

$0\le(x-1)\le 1$

$1\le x\le 1+1\Rightarrow[1, 2]$

Ans: (a)

52. The value of $\cos\left(\sin^{-1}\frac{\pi}{3}+\cos^{-1}\frac{\pi}{3}\right)$ is

(a) 0 (b) 1 (c) -0 (d) Does not exist

Sol: $\cos\left(\frac{\pi}{2}\right)=0$ $\left(\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2}\right)$

Ans: (a)

53. If $A=\begin{pmatrix}0&0&1\\0&1&0\\1&0&0\end{pmatrix}$, then A^4 is equal to

(a) A (b) $2A$ (c) I (d) $4A$

Sol: $A\cdot A=A^2=I$

$A^4=A^2\cdot A^2=I-I=I$

$A^4=I$

Ans: (c)

54. If $A=\{a, b, c\}$, then the number of binary operations on A is

(a) 3 (b) 3^6 (c) 3^3 (d) 3^9

Sol: By Conception. n^{n^2}

$=3^{3^2}=3^9$

Ans: (d)

55. If $\begin{pmatrix}2&1\\3&2\end{pmatrix}A=\begin{pmatrix}1&0\\0&1\end{pmatrix}$, then the matrix a is

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

Sol: $BA=I\Rightarrow B=A^{-1}$

Ans: (b)

56. If $f(x)=\begin{vmatrix} x^3-x & a+x & b+x \\ x-a & x^2-x & c+x \\ x-b & x-c & 0 \end{vmatrix}$ then

(a) $f(1)=0$ (b) $f(2)=0$ (c) $f(0)=0$ (d) $f(-1)=0$

Sol: By substitution

Ans: (c)

57. If A and B are square matrices of same order and B is a skew symmetric matrix, then $A'BA$ is

(a) Symmetric matrix (b) Null matrix

(c) Diagonal matrix (d) Skew symmetric matrix

Sol: $(A'BA)^{+}=(BA)^{+}(A')'\quad B^{+}=-3$

$=A'B^{T}A$

$=A'(-B)A$

$=-A'BA$

Ans: (d)

58. If A is a square matrix of order 3 and $|A|=5$, then $|A\,adj\cdot A|$ is

(a) 5 (b) 125 (c) 25 (d) 625

Sol: $(Adj)=|A|^{n}=5^{3}=125$

Ans: (b)

59. If $f(x)\begin{cases} \dfrac{1-\cos Kx}{x\sin x}, & \text{If } x\neq 0 \\ \dfrac{1}{2}, & \text{If } x=0 \end{cases}$ is continuous at $x=0$, then the value of K is

(a) $\pm\dfrac{1}{2}$ (b) 0 (c) ± 2 (d) ± 1

Sol: $\lim\limits_{x\to 0}\dfrac{1-\cos|x}{x\sin x},\ f(0)=\dfrac{1}{2}$ by L' Hoptial rule

$$\frac{k\sin x}{x\cos x+\sin x}=\lim_{x\to 0}\frac{k^2\cos x}{-x\sin x+\cos x+\cos x}$$

$$=\frac{k^2\times 1}{1+1}=\frac{1}{2}$$

$k=\pm 1$

Ans: (d)

60. If $a_1 a_2 a_3 .....a_9$ are in A.P. then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is

(a) $\frac{9}{2}(a_1 + a_9)$ (b) $a_1 + a_9$ (c) $\log_e(\log_e e)$ (d) 1

Sol: By verification

8, 1, 2.........9, $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ 20

$\log(\log e) = \log 1 = 0$

Ans: (c)

Key Answers:

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

26. (g)