KCET EXAMINATION – 2020
SUBJECT : MATHEMATICS

DATE :- 30-07-2020 **TIME : 02.30 PM TO 03.50 PM**

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

Ans. b

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

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

$=-2^{y-x}$

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) $-\frac{1}{\sqrt{3}}$

Ans. b

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

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

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

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

Ans. b

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

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

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

$=\frac{0-1}{0+1}=-1$

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

Ans. b

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

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

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

$=n(n+1)y$

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

Ans. d

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

$\therefore y^2=2$

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

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

$k^2=8$

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) $\frac{e^x}{x(y-1)}$

Ans. a

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

Take log on both sides

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

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

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

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%

Ans. a

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

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

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

$= 2 \times 5 = 10\%$

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

Ans. b

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

$= \int \frac{1}{x^2+1} dx + \frac{1}{3}\int \frac{3x^2}{x^6+1} dx$ Let x^3=t, $3x^2$dx=dt

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

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

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

Ans. c

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

$f^1(x) = 0$

x=e

$f^{11}(e) < 0$

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

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

Ans. a

Sol. Let sinx=t
cosx dx=dt

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

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

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

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

Ans. b

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)

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

$2I = \pi(1)$

$I = \pi / 2$

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

Ans. d

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 $x = 1, 2, 3$

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

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) $\frac{\pi}{8}\log 2$

Ans. d

Sol. Let x=tan θ

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

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

$I = \int_0^{\frac{\pi}{4}} \log(1+\tan\theta)d\theta.....(1)$

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

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

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

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

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

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

Ans. b

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

$= \left(\frac{4\sqrt{2}}{3}x^{3/2}-x^2\right)_0^2$

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

$= \frac{4}{3}$

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

a) 2 b) 0 c) 1 d) -2

Ans. c

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

16. The order of the differential equation obtained by eliminating arbitrary constants in the family of curves $c_1y=(c_2+c_3)e^{x+c_4}$ is

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

Ans. a

Sol. $C_1y = k_1e^x.e^{cy}$

$y = \frac{k_1e^{cy}}{c_1}e^x$

$y=ke^x$

order = 1

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

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

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

Ans. a

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

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

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

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

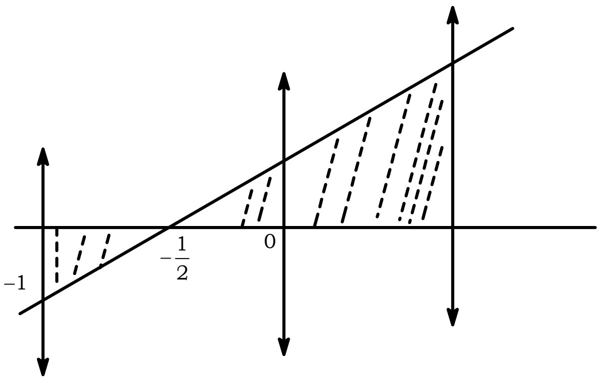
$y = x^2\sin x + cx^2$

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

Ans. c

Sol. Area $=\frac{1}{2}\times\frac{1}{2}\times1+\frac{1}{2}\times\frac{3}{2}\times3$



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

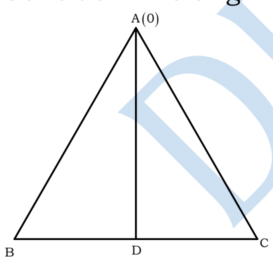
$=\frac{5}{2}$

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) $\sqrt{14}$

Ans. d

Sol. Consider A as origin



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

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

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) $|\vec{a}-\vec{b}|$

Ans. c

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

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

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

$|\vec{a}-\vec{b}|^2=2.2\sin^2(\theta/2)$

$|\vec{a}-\vec{b}|=2\sin(\theta/2)$

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

Ans. d

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

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

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

Ans. c

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

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

$|\vec{b}|=2$

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

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

Ans. c

Sol. Fourth octant

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

Ans. a

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

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

$\lambda = 6$

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) $\frac{\sqrt{293}}{49}$

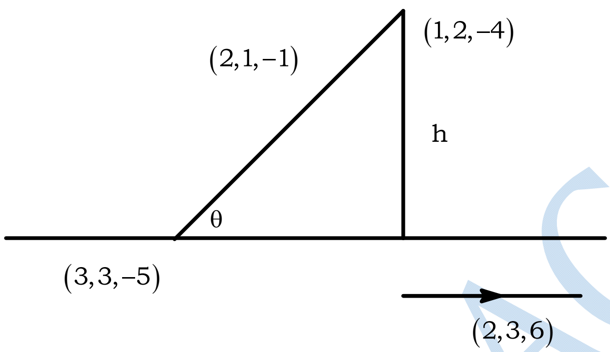
Ans. b

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

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

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

$= \frac{\sqrt{293}}{7}$



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

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

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) $\frac{\pi}{2}$

Ans. a

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

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

$\cos^2\gamma = 1-1/2$

$=1/2$

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

$\gamma = \pi/4$

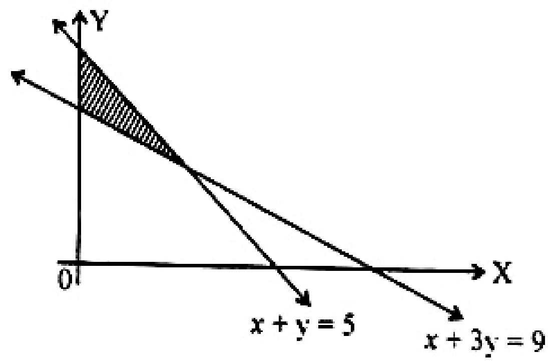
28. Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1) and (3, 0). Let $z = px+qy$, where p, q>0. Condition on p and q so that the minimum of z occurs at (3, 0) and (1, 1) is

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

Ans. b

Sol. z=px+qy
Z occurs minimum at (3, 0), (1, 1)
3p=p+q
2p=q

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)

Ans. d

Sol. Corner points (0,3), (0,5), (3,2)
∴ maximum value at (3,2)

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) $\frac{1013}{1024}$

Ans. b

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

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

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

$= 1 - \frac{1}{2^{10}}$

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

$= \frac{1023}{1024}$

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 $P(A'/B)$ is

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

Ans. a

Sol. $p(A'/B) = \frac{p(A' \cap B)}{p(B)}$

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

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

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

32. Events E_1 and E_2 from a partition of the sample space S. A is any event such that $P(E_1) = P(E_2) = \frac{1}{2}, P(E_2 / A) = \frac{1}{2}$ and $P(A / E_2) = \frac{2}{3}$, then $P(E_1 / A)$ is

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

Ans. a

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

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

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

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

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

$p(E_1 / A) = \frac{P(E_1 \cap A)}{P(A)} = \frac{1/3}{2/3} = 1/2$

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) $\frac{1}{8}$

Ans. b

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

Probability of the problem solved by any two

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

$= \frac{1}{4}$

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

Ans. d

Sol. $2 \times p \quad 10$

$2 = 1024 = 2$

$2p = 10$

$n(B) = p = 5$

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

a) 1 b) 0 c) $\sin 12^\circ$ d) $\cos 12^\circ$

Ans. a

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

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

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

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

Ans. a

Sol. $\text{Tan}A + \frac{1}{\text{Tan}A} = 2$

$(\text{Tan}A - 1)^2 = 0$

$\text{Tan}A = 1, \; A = 45^0$

$\text{Tan}^4 45^0 + \cos^4 .45 = 2$

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

Ans. c

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

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

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

Ans. d

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

$4x = 0$

$x = 0,\ y - \text{axis}$

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) ${}^{17}C_3$

Ans. a

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

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

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

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

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

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

Ans. a

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

$n = 10,\ r = 3$

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

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

Ans. c

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

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) $lm' + ml' = 0$

Ans. a

Sol. $m_1 = -l/m \quad m_2 = -l'/m'$

$m_1 \times m_2 = -1$

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

$ll' + mn' = 0$

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

Ans. b

Sol. $x^2 = 4ay \Rightarrow 2^2 = 4a \times 1 \Rightarrow a = 1$

$4a = 4 \times 1 = 4$

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

Ans. c

Sol. $d = S_2 - 2S_1$

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 number x and y, $x + y \neq y + x$

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

Ans. c

Sol. By concept

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

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

Ans. a

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

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

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

Ans. a

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

$\lim_{x\to0}\frac{\tan x}{x}\times\lim_{x\to0}\frac{\left(\sqrt{2x+4}+2\right)}{2}$

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

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

Ans. c

Sol. By concept

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) $[5,\infty)$

Ans. b

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

$=(x-2)^2+1$

$1+(x-2)^2\ge0+1$

$y\ge1\Rightarrow y\in[1,\infty)$

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) $\frac{4}{11}$

Ans. c

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

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

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

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

$P(B)=\frac{3}{11}$

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]

Ans. a

Sol. $0\le\sqrt{x-1}\le1$

$0\le(x-1)\le1$

$1\le x\le1+1\Rightarrow[1,2]$

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

Ans. a

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

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

Ans. c

Sol. $A.A=A^2=I$

$A^4=A^2.A^2=I-I=I$

$A^4=I$

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

Ans. d

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

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

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) $\begin{pmatrix}2&-1\\3&2\end{pmatrix}$

Ans. b

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

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) $f(-1)=0$

Ans. c

Sol. By substitution

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

Ans. d

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

$= A'B^{T}A$

$= A'(-B)A$

$= -A'BA$

58. If A is a square matrix of order 3 and |A|=5, then |A adj.A| is
a) 5 b) 125 c) 25 d) 625

Ans. b

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

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

a) $\pm\frac{1}{2}$ b) 0

c) ± 2 d) ± 1

Ans. d

Sol. $\lim_{x\to 0}\frac{1-\cos x}{x\sin x},\ f(0) = \frac{1}{2}$

by L,Hoptial rule

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

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

$k = \pm 1$

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

Ans. c

Sol. By verification

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

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