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KCET EXAMINATION - 2024

SUBJECT : MATHEMATICS

VERSION : D4

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## CONGRATULATIONS

### II PU SCIENCE ANNUAL EXAM 2024 RESULT



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REG NO. 20249143765

**595**

**MARKS**



**KAVANA M**

State **5<sup>th</sup>**  
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**594**

**MARKS**

 NANDITHA R REG NO. 20249144309	 POORVIKA REG NO. 20249144412	 NAVYA REG NO. 20249144317	 TEJASWINI N N REG NO. 20249144765	 SPOORTHI T REG NO. 20249144893	 BRUNIKA K REG NO. 20249143993	 AMITH R ALWANDI REG NO. 20249143764	 SHREYA D REG NO. 20249144053	 KAVYASHREE REG NO. 20249144123	 DEVIKA B REG NO. 20249143939	 KETHANA P V REG NO. 20249144132	 KARTHIK REG NO. 20249144413
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NO. OF STUDENTS  
**452**

DISTINCTION  
**347**

FIRST CLASS **104**  
SECOND CLASS **1**

**100** % PASS

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1. The value of C in (0, 2) satisfying the mean value theorem for the function  $f(x) = x(x-1)^2$ ,  $x \in [0, 2]$  is equal to

- (A)  $\frac{3}{4}$       (B)  $\frac{4}{3}$       (C)  $\frac{1}{3}$       (D)  $\frac{2}{3}$

**Ans. B**

**Sol.**  $f(2) = 2, \quad f(0) = 0$

$$f'(c) = \frac{2-0}{2-0} = 1$$

$$f'(c) = 2c(c-1) + (c-1)^2$$

option verification

2.  $\frac{d}{dx} \left[ \cos^2 \left( \cot^{-1} \sqrt{\frac{2+x}{2-x}} \right) \right]$  is

- (A)  $-\frac{3}{4}$   
 (B)  $-\frac{1}{2}$   
 (C)  $\frac{1}{2}$   
 (D)  $\frac{1}{4}$

**Ans. D**

**Sol.**  $x = 2 \cos \theta$

$$\frac{2+x}{2-x} = \frac{2(1+\cos\theta)}{2(1-\cos\theta)} = \cot^2 \frac{\theta}{2}$$

$$\therefore \frac{d}{dx} \frac{1}{2} (1+\cos\theta) = \frac{1}{2} \frac{d}{dx} \left( 1 + \frac{x}{2} \right)$$

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

3. For the function  $f(x) = x^3 - 6x^2 + 12x - 3$ ;  $x = 2$  is

- (A) a point of minimum  
 (B) a point of inflexion  
 (C) not a critical point  
 (D) a point of maximum

**Ans. B**

**Sol.**  $f'(x) = 3x^2 - 12x + 12$

$$f''(x) = 6x - 12$$

$$f''(2) = 0$$

$$f'''(2) \neq 0$$

4. The function  $f(x) = |\cos x|$  is

- (A) Everywhere continuous and differentiable  
 (B) Everywhere continuous but not differentiable at odd multiples of  $\frac{\pi}{2}$   
 (C) Neither continuous nor differentiable at  $(2n+1)\frac{\pi}{2}, n \in Z$   
 (D) Not differentiable everywhere

**Ans. B**

**Sol. Conceptual**

5. If  $y = 2x^{3x}$ , then  $\frac{dy}{dx}$  at  $x = 1$  is

- (A) 2      (B) 6      (C) 3      (D) 1

**Ans. B**

**Sol.**  $\log y = \log(2 \cdot x^{3x})$

$$= \log 2 + 3x \log x$$

$$\frac{1}{y} \frac{dy}{dx} = 3 \left[ x \cdot \frac{1}{x} + \log x \right]$$

$$\frac{dy}{dx} = 2 \cdot x^{3x} \cdot 3(1 + \log x)$$

$$\left( \frac{dy}{dx} \right)_{x=1} = 6$$

6. Let the function satisfy the equation  $f(x+y) = f(x)f(y)$  for all  $x, y \in R$ , where  $f(0) \neq 0$ . If  $f(5) = 3$  and  $f'(0) = 2$ , then  $f'(5)$  is

- (A) 6      (B) 0      (C) 5      (D) -6

**Ans. A**

**Sol.**  $f(x) = k^x$

$$f(5) = 3$$

$$k^5 = 3$$

$$\therefore f(x) = 3^{x/5}$$

$$f'(x) = 3^{x/5} \log_e 3 \cdot \frac{1}{5}$$

$$f'(0) = 2$$

$$\frac{\log_e 3}{5} = 2$$

$$\log_e 3 = 10$$

$$f'(x) = 2(3)^{x/5}$$

$$f'(5) = 2 \times 3 = 6$$

7.  $\int \frac{1}{x[6(\log x)^2 + 7\log x + 2]} dx =$

(A)  $\frac{1}{2} \log \left| \frac{2\log x + 1}{3\log x + 2} \right| + C$

(B)  $\log \left| \frac{2\log x + 1}{3\log x + 2} \right| + C$

(C)  $\log \left| \frac{3\log x + 2}{2\log x + 1} \right| + C$

(D)  $\frac{1}{2} \log \left| \frac{3\log x + 2}{2\log x + 1} \right| + C$

Ans. B

Sol. Put  $\log x = t \Rightarrow \frac{1}{x} dx = dt$

$I = \int \frac{1}{(3t+2)(2t+1)} dt$

$\frac{1}{(3t+2)(2t+1)} = \frac{A}{3t+2} + \frac{B}{2t+1}$

After solving  $A = -3, B = 2$

$\therefore I = \int \frac{-3}{3t+2} dt + \int \frac{2}{2t+1} dt$   
 $= -\log|3t+2| + \log|2t+1| + C$

8.  $\int \frac{\sin \frac{5x}{2}}{\sin \frac{x}{2}} dx =$

(A)  $2x + \sin x + 2\sin 2x + C$

(B)  $x + 2\sin x + 2\sin 2x + C$

(C)  $x + 2\sin x + \sin 2x + C$

(D)  $2x + \sin x + \sin 2x + C$

Ans. C

Sol.  $\int \frac{2\sin\left(\frac{5x}{2}\right)\cos\frac{x}{2}}{2\sin\frac{x}{2}\cos\frac{x}{2}} dx$

$= \int \frac{\sin 3x + \sin 2x}{\sin x} dx$

$= \int 3 - 4\sin^2 x + 2\cos x dx$

$= \int 1 + 2\cos 2x + 2\cos x dx$

$= x + \sin 2x + 2\sin x + C$

9.  $\int_1^5 (|x-3| + |1-x|) dx =$

(A) 12 (B)  $\frac{5}{6}$  (C) 21 (D) 10

Ans. A

Sol.  $\int_1^5 (|x-3| + |x+1|) dx$

$= \int_1^3 2dx + \int_3^5 2x - 4dx$

$= 2(2) + (x^2 - 4x)_3^5$

$= 4 + [(25 - 20) - (9 - 12)] = 4 + 8 = 12$

10.  $\lim_{n \rightarrow \infty} \left( \frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} + \dots + \frac{1}{5n} \right) =$

(A)  $\frac{\pi}{4}$  (B)  $\tan^{-1} 3$  (C)  $\tan^{-1} 2$  (D)  $\frac{\pi}{2}$

Ans. C

Sol.  $\lim_{n \rightarrow \infty} \sum_{r=1}^{2n} \left( \frac{n}{n^2+r^2} \right)$

$= \lim_{n \rightarrow \infty} \sum_{r=1}^{2n} \frac{n}{n^2 \left( 1 + \left( \frac{r}{n} \right)^2 \right)}$

$= \int_0^2 \frac{1}{1+x^2} dx = \tan^{-1} 2$

11. The area of the region bounded by the line  $y = 3x$  and the curve  $y = x^2$  in sq. units is

(A) 10

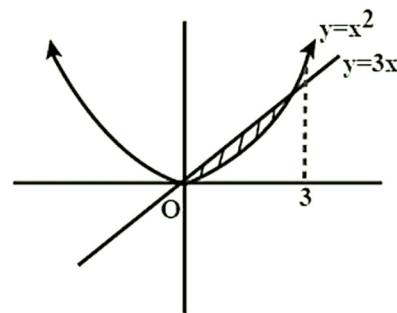
(B)  $\frac{9}{2}$

(C) 9

(D) 5

Ans. B

Sol.  $A = \int_0^3 (3x - x^2) dx = 3 \left( \frac{x^2}{2} - \frac{x^3}{3} \right) \Big|_0^3 = \frac{9}{2}$

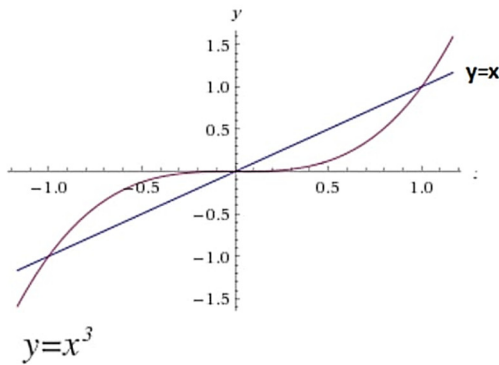




12. The area of the region bounded by the line  $y = x$  and the curve  $y = x^3$  is  
 (A) 0.2 sq. units  
 (B) 0.3 sq. units  
 (C) 0.4 sq. units  
 (D) 0.5 sq. units

**Ans. D**

**Sol.**  $A = 2 \int_0^1 (x - x^3) dx = 2 \left[ \frac{x^2}{2} - \frac{x^4}{4} \right]_0^1 = 0.5 \text{ sq. units}$



13. If  $\vec{a}, \vec{b}, \vec{c}$  are three non-coplanar vectors and  $p, q, r$  are vectors defined by  $\vec{p} = \frac{\vec{b} \times \vec{c}}{[\vec{a} \ \vec{b} \ \vec{c}]}$ ,  $\vec{q} = \frac{\vec{c} \times \vec{a}}{[\vec{a} \ \vec{b} \ \vec{c}]}$ ,  $\vec{r} = \frac{\vec{a} \times \vec{b}}{[\vec{a} \ \vec{b} \ \vec{c}]}$ , then  $(\vec{a} + \vec{b}) \cdot \vec{p} + (\vec{b} + \vec{c}) \cdot \vec{q} + (\vec{c} + \vec{a}) \cdot \vec{r}$  is  
 (A) 0 (B) 1 (C) 2 (D) 3

**Ans. D**

**Sol.** Since  $\vec{a} \cdot (\vec{b} \times \vec{c}) = [\vec{a} \ \vec{b} \ \vec{c}]$ ,  
 $(\vec{a} + \vec{b}) \cdot \vec{p} + (\vec{b} + \vec{c}) \cdot \vec{q} + (\vec{c} + \vec{a}) \cdot \vec{r} = 1 + 1 + 1 = 3$

14. If lines  $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$  and  $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$  are mutually perpendicular, then  $k$  is equal to  
 (A)  $-\frac{10}{7}$   
 (B)  $-\frac{7}{10}$   
 (C) -10  
 (D) -7

**Ans. A**

**Sol.**  $(-3)(3k) + (2k)(1) + 2(-5) = 0$

15. The distance between the two planes  $2x + 3y + 4z = 4$  and  $4x + 6y + 8z = 12$  is  
 (A) 2 units (B) 8 units  
 (C)  $\frac{2}{\sqrt{29}}$  units (D) 4 units

**Ans. C**

**Sol.**  $d = \frac{|6 - 4|}{\sqrt{4 + 9 + 16}} = \frac{2}{\sqrt{29}}$

16. The sine of the angle between the straight line  $\frac{x-2}{3} = \frac{y-3}{4} = \frac{4-z}{-5}$  and the plane  $2x - 2y + z = 5$  is  
 (A)  $\frac{1}{5\sqrt{2}}$  (B)  $\frac{2}{5\sqrt{2}}$  (C)  $\frac{3}{50}$  (D)  $\frac{3}{\sqrt{50}}$

**Ans. A**

**Sol.**  $\sin \theta = \frac{3(2) + 4(-2) + 5(1)}{\sqrt{9 + 16 + 25} \sqrt{4 + 4 + 1}}$

17. The equation  $xy = 0$  in three-dimensional space represents  
 (A) a pair of straight lines  
 (B) a plane  
 (C) a pair of planes at right angles  
 (D) a pair of parallel planes

**Ans. C**

**Sol. Conceptual**

18. The plane containing the point  $(3, 2, 0)$  and the line  $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$  is  
 (A)  $x - y + z = 1$   
 (B)  $x + y + z = 5$   
 (C)  $x + 2y - z = 1$   
 (D)  $2x - y + z = 5$

**Ans. A**

**Sol.**  $\vec{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 4 & 4 \\ 1 & 5 & 4 \end{vmatrix}$   
 $= \hat{i}(16 - 20) - \hat{j}(0 - 4) + \hat{k}(0 - 4)$   
 $= -4\hat{i} + 4\hat{j} - 4\hat{k}$   
 $\therefore$  Eq. of plane is  $-4(x - 3) + 4(y - 2) - 4(z - 0) = 0$   
 $\Rightarrow -4x + 12 + 4y - 8 - 4z = 0$   
 $\Rightarrow x - y + z = 1$

19. Corner points of the feasible region for an LPP are (0, 2), (3,0), (6, 0), (6, 8) and (0, 5). Let  $z = 4x + 6y$  be the objective function. The minimum value of  $z$  occurs at  
 (A) Only (0, 2)  
 (B) Only (3, 0)  
 (C) The mid-point of the line segment joining the points (0, 2) and (3, 0)  
 (D) Any point on the line segment joining the points (0, 2) and (3, 0)

**Ans. D**

**Sol. Conceptual**

20. A die is thrown 10 times. The probability that an odd number will come up at least once is  
 (A)  $\frac{11}{1024}$  (B)  $\frac{1013}{1024}$  (C)  $\frac{1023}{1024}$  (D)  $\frac{1}{1024}$

**Ans. C**

**Sol.**  $n = 10, p = \frac{1}{2}; q = \frac{1}{2}$

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

$$= 1 - {}^{10}C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{10}$$

21. A random variable  $X$  has the following probability distribution :

X	0	1	2
P(X)	$\frac{25}{36}$	k	$\frac{1}{36}$

If the mean of the random variable  $X$  is  $\frac{1}{3}$ ,

then the variance is

(A)  $\frac{1}{18}$

(B)  $\frac{5}{18}$

(C)  $\frac{7}{18}$

(D)  $\frac{11}{18}$

**Ans. B**

**Sol.**  $\sum p_i x_i = \frac{1}{3} \Rightarrow 0 + k + \frac{2}{36} = \frac{1}{3} \Rightarrow k = \frac{1}{3} - \frac{1}{18} = \frac{5}{18}$

$$\sigma^2 + \mu^2 = \frac{\sum p_i x_i^2}{\sum p_i} = \frac{0 + 6 + \frac{4}{36}}{1} = \frac{14}{36}$$

$$\Rightarrow \sigma^2 = \frac{14}{36} - \mu^2 = \frac{14}{36} - \frac{1}{9} = \frac{5}{18}$$

22. If a random variable  $X$  follows the binomial distribution with parameters  $n = 5, p$  and  $P(X = 2) = 9P(X = 3)$ , then  $p$  is equal to

(A) 10 (B)  $\frac{1}{10}$  (C) 5 (D)  $\frac{1}{5}$

**Ans. B**

**Sol.** Given  $n = 5, P(X = 2) = 9P(X = 3)$

$$\Rightarrow {}^n C_2 \cdot q^{n-2} \cdot p^2 = 9 \cdot {}^n C_3 \cdot q^{n-3} \cdot p^3$$

$$\Rightarrow q = 3(n - 2) \cdot p$$

$$\Rightarrow 1 - p = 3(3) \cdot p$$

$$\Rightarrow p = \frac{1}{10}$$

23. Two finite sets have  $m$  and  $n$  elements respectively. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of  $m$  and  $n$  respectively are

(A) 7, 6 (B) 5, 1 (C) 6, 3 (D) 8, 7

**Ans. C**

**Sol.**  $2^m = 56 + 2^n$  then verification  $m = 6, n = 3$

24. If  $[x]^2 - 5[x] + 6 = 0$ , where  $[x]$  denotes the greatest integer function, then

(A)  $x \in [3, 4]$  (B)  $x \in [2, 4]$

(C)  $x \in [2, 3]$  (D)  $x \in (2, 3]$

**Ans. B**

**Sol.**  $([x] - 2)([x] - 3) = 0$

$$\Rightarrow [x] = 2 \text{ or } [x] = 3$$

$$\Rightarrow x \in [2, 4)$$

25. If in two circles, arcs of the same length subtend angles  $30^\circ$  and  $78^\circ$  at the centre, then the ratio of their radii is

(A)  $\frac{5}{13}$  (B)  $\frac{13}{5}$  (C)  $\frac{13}{4}$  (D)  $\frac{4}{13}$

**Ans. B**

**Sol.**  $l_1 = l_2, \theta_1 = 30^\circ, \theta_2 = 78^\circ$

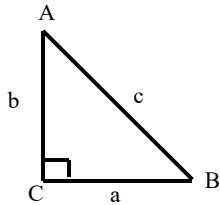
$$\text{Then } \frac{l_1}{l_2} = \frac{r_1 \theta_1}{r_2 \theta_2} \Rightarrow \frac{r_1}{r_2} = \frac{\theta_2}{\theta_1} = \frac{78^\circ}{30^\circ} = \frac{13}{5}$$

26. If  $\Delta ABC$  is right angled at C, then the value of  $\tan A + \tan B$  is

- (A)  $a + b$  (B)  $\frac{a^2}{bc}$   
 (C)  $\frac{c^2}{ab}$  (D)  $\frac{b^2}{ac}$

**Ans. C**

**Sol.**



Since C is a right angle then

$$\tan A + \tan B = \frac{a}{b} + \frac{b}{a} = \frac{a^2 + b^2}{ab} = \frac{c^2}{ab}$$

27. The real value of ' $\alpha$ ' for which  $\frac{1 - i \sin \alpha}{1 + 2i \sin \alpha}$  is purely real is

- (A)  $(n+1)\frac{\pi}{2}, n \in \mathbb{N}$   
 (B)  $(2n+1)\frac{\pi}{2}, n \in \mathbb{N}$   
 (C)  $n\pi, n \in \mathbb{N}$   
 (D)  $(2n-1)\frac{\pi}{2}, n \in \mathbb{N}$

**Ans. C**

**Sol.**  $z = \frac{1 - i \sin \alpha}{1 + 2i \sin \alpha}$ , after simplify

$$z = \frac{(1 - 2 \sin^2 \alpha) + i(-3 \sin \alpha)}{1 + 4 \sin^2 \alpha} \text{ and } z \text{ is purely real}$$

then  $\text{Im}(z) = 0$

$$\Rightarrow \sin \alpha = 0$$

$$\Rightarrow \alpha = n\pi, n \in \mathbb{N}$$

28. The length of a rectangle is five times the breadth. If the minimum perimeter of the rectangle is 180 cm, then

- (A) Breadth  $\leq 15$  cm  
 (B) Breadth  $\geq 15$  cm  
 (C) Length  $\leq 15$  cm  
 (D) Length = 15 cm

**Ans. B**

**Sol.** Given  $l = 5b, P \geq 180$

$$\Rightarrow 2(l + b) \geq 180$$

$$\Rightarrow b \geq 15$$

29. The value of

$${}^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + {}^{45}C_3 + {}^{45}C_4 \text{ is}$$

- (A)  ${}^{50}C_4$   
 (B)  ${}^{50}C_3$   
 (C)  ${}^{50}C_2$   
 (D)  ${}^{50}C_1$

**Ans. A**

**Sol.** Since  $n_{C_r} + n_{C_{r-1}} = (n+1)_{C_r}$ ,

$$\begin{aligned} & {}^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + ({}^{45}C_3 + {}^{45}C_4) \\ &= {}^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + {}^{46}C_4 \dots \\ &= {}^{50}C_4 \end{aligned}$$

30. In the expansion of  $(1+x)^n$

$$\frac{C_1}{C_0} + 2 \frac{C_2}{C_1} + 3 \frac{C_3}{C_2} + \dots + n \frac{C_n}{C_{n-1}} \text{ is equal to}$$

- (A)  $\frac{n(n+1)}{2}$   
 (B)  $\frac{n}{2}$   
 (C)  $\frac{n+1}{2}$   
 (D)  $3n(n+1)$

**Ans. A**

**Sol.**  $\frac{C_1}{C_0} + 2 \frac{C_2}{C_1} + 3 \frac{C_3}{C_2} + \dots + n \frac{C_n}{C_{n-1}}$

$$= n + (n-1) + (n-2) + \dots + 1 = \frac{n(n+1)}{2}$$

31. If  $S_n$  stands for sum to n-terms of a G.P. with 'a' as the first term and 'r' as the common ratio then  $S_n : S_{2n}$  is

- (A)  $r^n + 1$   
 (B)  $\frac{1}{r^n + 1}$   
 (C)  $r^n - 1$   
 (D)  $\frac{1}{r^n - 1}$

**Ans. B**

**Sol.** 
$$\frac{S_n}{S_{2n}} = \frac{\frac{a(r^n - 1)}{r - 1}}{\frac{a(r^{2n} - 1)}{r - 1}} = \frac{r^n - 1}{(r^n - 1)(r^n + 1)} = \frac{1}{(r^n + 1)}$$

32. If A.M. and G.M. of roots of a quadratic equation are 5 and 4 respectively, then the quadratic equation is  
 (A)  $x^2 - 10x - 16 = 0$  (B)  $x^2 + 10x + 16 = 0$   
 (C)  $x^2 + 10x - 16 = 0$  (D)  $x^2 - 10x + 16 = 0$

**Ans. D**

**Sol.** Given A.M. =  $\frac{\alpha + \beta}{2} = 5 \Rightarrow \alpha + \beta = 10$ ,

$$G.M. = \sqrt{\alpha\beta} = 4 \Rightarrow \alpha\beta = 16$$

$\therefore$  The quadratic equation is

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

33. The angle between the line  $x + y = 3$  and the line joining the points  $(1,1)$  and  $(-3,4)$  is

- (A)  $\tan^{-1}(7)$  (B)  $\tan^{-1}\left(-\frac{1}{7}\right)$   
 (C)  $\tan^{-1}\left(\frac{1}{7}\right)$  (D)  $\tan^{-1}\left(\frac{2}{7}\right)$

**Ans. C**

**Sol.** Slope of  $x + y = 3$  is  $m_1 = -1$  and

Slope of line joining the points  $(1,1), (-3,4)$  is

$$m_2 = -\frac{3}{4}$$

$$\text{and } \tan \theta = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right| \Rightarrow \theta = \tan^{-1} \frac{1}{7}$$

34. The equation of parabola whose focus is  $(6,0)$  and directrix is  $x = -6$  is

- (A)  $y^2 = 24x$  (B)  $y^2 = -24x$   
 (C)  $x^2 = 24y$  (D)  $x^2 = -24y$

**Ans. A**

**Sol.** Focus =  $F = (a, 0) = (6, 0)$

Equation of directrix is  $x = -6$  then equation of parabola is of the form  $y^2 = 4ax, a = 6$

35.  $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sqrt{2} \cos x - 1}{\cot x - 1}$  is equal to

- (A) 2 (B)  $\sqrt{2}$  (C)  $\frac{1}{2}$  (D)  $\frac{1}{\sqrt{2}}$

**Ans. C**

**Sol.** By L.H. Rule

$$\text{Lt}_{x \rightarrow \frac{\pi}{4}} \frac{-\sqrt{2} \times \sin x - 0}{-\text{cosec}^2 x} = \frac{\sqrt{2} \times \frac{1}{\sqrt{2}}}{(\sqrt{2})^2} = \frac{1}{2}$$

36. The negation of the statement "For every real number  $x; x^2 + 5$  is positive" is  
 (A) For every real number  $x; x^2 + 5$  is not positive.  
 (B) For every real number  $x; x^2 + 5$  is negative  
 (C) There exists at least one real number  $x$  such that  $x^2 + 5$  is not positive  
 (D) There exists at least one real number  $x$  such that  $x^2 + 5$  is positive

**Ans. C**

**Sol. Conceptual**

37. Let  $a, b, c, d$  and  $e$  be the observations with mean  $m$  and standard deviation  $S$ . The standard deviation of the observations  $a + k, b + k, c + k, d + k$  and  $e + k$  is

- (A)  $kS$  (B)  $S + k$  (C)  $\frac{S}{k}$  (D)  $S$

**Ans. D**

**Sol.** adding constant each observation of S.D does not effect.

38. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be given by  $f(x) = \tan x$ . Then  $f^{-1}(1)$  is

- (A)  $\frac{\pi}{4}$   
 (B)  $\left\{ n\pi + \frac{\pi}{4} : n \in \mathbb{Z} \right\}$   
 (C)  $\frac{\pi}{3}$   
 (D)  $\left\{ n\pi + \frac{\pi}{3} : n \in \mathbb{Z} \right\}$

**Ans. A**

**Sol.**  $\tan x = 1 \Rightarrow x = n\pi + \frac{\pi}{4}$

39. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = x^2 + 1$ . Then the pre images of 17 and -3 respectively are

- (A)  $\phi, \{4, -4\}$   
 (B)  $\{3, -3\}, \phi$   
 (C)  $\{4, -4\}, \phi$   
 (D)  $\{4, -4\}, \{2, -2\}$

**Ans. C**

**Sol.**  $f(x) = x^2 + 1 = 17 \Rightarrow x = \pm 4$

$x^2 + 1 = -3$  is not possible.

No preimage of -3

40. Let  $(g \circ f)(x) = \sin x$  and  $(f \circ g)(x) = (\sin \sqrt{x})^2$ .

Then

(A)  $f(x) = \sin^2 x, g(x) = x$

(B)  $f(x) = \sin \sqrt{x}, g(x) = \sqrt{x}$

(C)  $f(x) = \sin^2 x, g(x) = \sqrt{x}$

(D)  $f(x) = \sin \sqrt{x}, g(x) = x^2$

**Ans. C**

**Sol.**  $g(f(x)) = g(\sin^2 x) = \sqrt{\sin^2 x} = \sin x$

$f(g(x)) = f[\sqrt{x}] = (\sin \sqrt{x})^2$

41. Let  $A = \{2, 3, 4, 5, \dots, 16, 17, 18\}$ . Let R be the relation on the set A of ordered pairs of positive integers defined by  $(a, b) R (c, d)$  if and only if  $ad=bc$  for all  $(a, b), (c, d)$  in  $A \times A$ . Then the number of ordered pairs of the equivalence class of  $(8, 2)$  is

- (A) 4 (B) 5 (C) 6 (D) 7

**Ans. C**

**Sol.** 6 Pairs

$\{(3, 2), (6, 4), (9, 6), (12, 8), (18, 12), (15, 10)\}$

42. If  $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 3\pi$ , then  $x(y+z)$

$+y(z+x) + z(x+y)$  equal to

- (A) 0 (B) 1 (C) 6 (D) 12

**Ans. C**

**Sol.**  $x = y = z = -1$

$\Rightarrow x(y+z) + y(z+x) + z(x+y) = 6$

43. If  $2 \sin^{-1} x - 3 \cos^{-1} x = 4, x \in [-1, 1]$  then  $2 \sin^{-1}$

$x + 3 \cos^{-1} x$  is equal to

(A)  $\frac{4-6\pi}{5}$

(B)  $\frac{6\pi-4}{5}$

(C)  $\frac{3\pi}{2}$

(D) 0

**Ans. B**

**Sol.**  $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

$\cos^{-1} x = \frac{\pi-4}{5}$

$\sin^{-1} x = \frac{3\pi+8}{10}$

44. If A is square matrix such that  $A^2 = A$ , then  $(I + A)^3$  is equal to

- (A)  $7A-I$  (B)  $7A$  (C)  $7A+I$  (D)  $I-7A$

**Ans. C**

**Sol.**  $(I + A)^3 = I + 3A + 3A + A = 7A + I$

45. If  $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ , then  $A^{10}$  is equal to

- (A)  $2^8 A$  (B)  $2^9 A$  (C)  $2^{10} A$  (D)  $2^{11} A$

**Ans. B**

**Sol.**  $A^2 = 2A, A^4 = A^3 A - A^{10} = 2^9 A$

46. If  $f(x) = \begin{vmatrix} x-3 & 2x^2-18 & 2x^3-81 \\ x-5 & 2x^2-50 & 4x^3-500 \\ 1 & 2 & 3 \end{vmatrix}$ , then

$f(1) \cdot f(3) + f(3) \cdot f(5) + f(5) \cdot f(1)$  is

- (A) -1 (B) 0 (C) 1 (D) 2

**Ans. No option**

**Sol.**

47. Let  $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2 \sin x & x & 2x \\ \sin x & x & x \end{vmatrix}$ . Then  $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} =$

(A) -1

(B) 0

(C) 3

(D) 2

**Ans. B**

**Sol.**  $f(x) = -x^2 \cos x + x \sin x$

$\therefore \lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 0$

48. Which one of the following observations is correct for the features of logarithm function to and base  $b > 1$ ?

(A) The domain of the logarithm function is R, the set of real numbers

(B) The range of the logarithm function is  $R^+$ , the set of all positive real numbers.

(C) The point  $(1, 0)$  is always on the graph of the logarithm function

(D) The graph of the logarithm function is decreasing as we move from left to right.

**Ans. C**

**Sol.**  $\log 1 = 0$



49. If  $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$  is the adjoint of a  $3 \times 3$  matrix

A and  $|A| = 4$ , then  $\alpha$  is equal to

- (A) 4 (B) 5 (C) 11 (D) 0

**Ans. C**

**Sol.**  $|P| = |A - A| = |A|^2 = 16 \Rightarrow 2\alpha - 6 = 16 \Rightarrow \alpha = 11$

50. If  $A = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$  and  $B = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ , then  $\frac{dB}{dx}$  is

- (A) 3A (B) -3B (C) 3B+1 (D) 1-3A

**Ans. A**

**Sol.**  $A = x^2 - 1, \frac{dB}{dx} = 3(x^2 - 1) = 3A$

51. If  $f(x) = xe^{x(1-x)}$  then  $f(x)$  is

- (A) increasing in  $\mathbb{R}$   
 (B) decreasing in  $\mathbb{R}$   
 (C) decreasing in  $[-\frac{1}{2}, 1]$   
 (D) increasing in  $[-\frac{1}{2}, 1]$

**Ans. D**

**Sol.**  $f'(x) = e^{x-x^2}(x-2x^2)$   
 $\Rightarrow f$  is increasing in  $[-\frac{1}{2}, 1]$

52.  $\int \frac{\sin x}{3 + 4\cos^2 x} dx =$

- (A)  $-\frac{1}{2\sqrt{3}} \tan^{-1}\left(\frac{2\cos x}{\sqrt{3}}\right) + C$   
 (B)  $\frac{1}{\sqrt{3}} \tan^{-1}\left(\frac{\cos x}{3}\right) + C$   
 (C)  $\frac{1}{2\sqrt{3}} \tan^{-1}\left(\frac{\cos x}{3}\right) + C$   
 (D)  $-\frac{1}{\sqrt{3}} \tan^{-1}\left(\frac{2\cos x}{3}\right) + C$

**Ans. A**

**Sol.** Put

$$\cos x = t \Rightarrow \int \frac{-dt}{3 + (2t)^2} = -\frac{1}{\sqrt{3}} \times \frac{1}{2} \times \tan^{-1}\left(\frac{2t}{\sqrt{3}}\right)$$

53.  $\int_{-\pi}^{\pi} (1-x^2) \sin x \cdot \cos^2 x dx =$

- (A)  $\pi - \frac{\pi^2}{3}$  (B)  $2\pi - \pi^3$   
 (C)  $\pi - \frac{\pi^3}{2}$  (D) 0

**Ans. D**

**Sol.**  $f(x)$  is Odd function, then  $I = 0$

54. The function  $x^x; x > 0$  is strictly increasing at

- (A)  $\forall x \in \mathbb{R}$  (B)  $x < \frac{1}{e}$   
 (C)  $x > \frac{1}{e}$  (D)  $x < 0$

**Ans. C**

**Sol.**  $f'(x) = x^x(1 + \log x) \Rightarrow f'(x) > 0 \Rightarrow x > \frac{1}{e}$

55. The maximum volume of the right circular cone with slant height 6 units is

- (A)  $4\sqrt{3}\pi$  cubic units  
 (B)  $16\sqrt{3}\pi$  cubic units  
 (C)  $3\sqrt{3}\pi$  cubic units  
 (D)  $6\sqrt{3}\pi$  cubic units

**Ans. B**

**Sol.**  $V = \frac{1}{3} \pi r^2 h,$   
 $l^2 = r^2 + h^2,$   
 $r^2 = 36 - h^2,$   
 $\Rightarrow x > 16\sqrt{3}\pi$   
 $V_{\max} = 16\sqrt{3}\pi$

56. The vectors  $\overline{AB} = 3\hat{i} + 4\hat{k}$  and  $\overline{AC} = 5\hat{i} - 2\hat{j} + 4\hat{k}$  are the sides of a  $\Delta ABC$ . The length of the median through A is

- (A)  $\sqrt{18}$  (B)  $\sqrt{72}$  (C)  $\sqrt{33}$  (D)  $\sqrt{288}$

**Ans. C**

**Sol.**  $\frac{1}{2} |\overline{AB} + \overline{AC}| = \frac{1}{2} |8\hat{i} - 2\hat{j} + 8\hat{k}| = \sqrt{33}$

57. The volume of the parallelepiped whose co-terminous edges are  $\hat{j} + \hat{k}$ ,  $\hat{i} + \hat{k}$  and  $\hat{i} + \hat{j}$  is  
 (A) 6 cu.units (B) 2 cu.units  
 (C) 4 cu.units (D) 3 cu.units

**Ans. B**

**Sol.** 
$$\begin{vmatrix} \hat{j} + \hat{k} & \hat{i} + \hat{k} & \hat{i} + \hat{j} \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix} = 2 \text{ cub units}$$

58. Let  $\vec{a}$  and  $\vec{b}$  be two unit vectors and  $\theta$  is the angle between them. Then  $\vec{a} + \vec{b}$  is a unit vector if  
 (A)  $\theta = \frac{\pi}{4}$  (B)  $\theta = \frac{\pi}{3}$   
 (C)  $\theta = \frac{2\pi}{3}$  (D)  $\theta = \frac{\pi}{2}$

**Ans. C**

**Sol.** 
$$|\vec{a} + \vec{b}|^2 = 1 \Rightarrow 1 + 1 + 2|\vec{a}||\vec{b}|\cos\theta = 1$$
  

$$\Rightarrow \cos\theta = -\frac{1}{2} \Rightarrow \theta = \frac{2\pi}{3}$$

59. The solution of  $e^{\frac{dy}{dx}} = x + 1, y(0) = 3$  is  
 (A)  $y - 2 = x \log x - x$   
 (B)  $y - x - 3 = x \log x$   
 (C)  $y - x - 3 = (x + 1) \log(x + 1)$   
 (D)  $y + x - 3 = (x + 1) \log(x + 1)$

**Ans. D**

**Sol.** 
$$\frac{dy}{dx} = \log(x + 1) \Rightarrow \int dy = \int \log(x + 1) dx$$
  
 And  $y(0) = 3$  then  

$$\Rightarrow y + x - 3 = (x + 1) \log(x + 1)$$

60. The family of curves whose x and y intercepts of a tangent at any point are respectively double the x and y coordinates of that point is  
 (A)  $xy = C$  (B)  $x^2 + y^2 = C$   
 (C)  $x^2 - y^2 = C$  (D)  $\frac{y}{x} = C$

**Ans. A**

**Sol.** 
$$\frac{x}{2x_1} + \frac{y}{2y_1} = 1 \Rightarrow xy = c$$





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 571 MANASA	 569 TANUSHA V	 569 M MAHESH BABU	 569 CHANDU	 568 AATHREYA SHASHI KUMAR	 568 ARPITH GOWDA S B	 568 GAUTHAMI HARIKRISHNA	 567 MAITRA PATIL	 566 SAMARTH PATIL	 565 DUDUKU TEJASWINI
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 559 MANOHAR R	 558 DHANUSH A	 558 SHIVANAND HALLI	 558 SIRISHA YADAV C	 558 MOUNIKA B S	 558 B V SUJEETH	 557 SHREDEVI	 557 SRIMANTH BHIMASHANKAR P	 557 TEJAS G	 557 AKSHITHA SRI M
 556 MEHAR ARFA	 555 ANJANEYA REDDY B M	 555 HARSHITHA YADAV R	 555 HARSHA M	 553 DHANUSHREE Y	 553 BHUVAN GOWDA H S	 553 RAJ SHEKAR M	 552 THANUSHREE N	 552 MONISHA M	 552 MADHU CHANDAN N
 551 TRISHA S	 551 CHANDANA S	 551 PRATHIKSHA A	 551 SAMERA ARYAA D B	 550 MOHITH S	 550 SHREYA R A	 550 MANJUNATH V	 550 SHABNUM KHANUM	 549 NUTHAN R	 547 ABIYA SAMUEL
 546 SHARANAGOURA BIRADAR	 545 HAJIRA KHANUM	 545 SRUJAN SHRISHAIL K	 544 NAYANA M S	 544 VINAYAK RAJU B	 541 ADITYA	 541 MANOHAR B S	 541 RATANRAJ BIRADAR	 540 THANUSHREE C	 540 ATHIYA KOUSAR
 540 BHAKTI SHIVAKUMAR HANJI	 540 SANJAY C V	<p>AND MANY MORE...</p> <p><b>REGISTRATION OPEN</b> PCMB NEET   JEE   KCET PCMCs</p>							

NO. OF STUDENTS	DISTINCTION	FIRST CLASS	64
<b>177</b>	<b>108</b>	SECOND CLASS	<b>3</b>



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