311302

23124

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Find the value of x if, $\log_5 (x^2 - 5x + 11) = 1$

(b) Find the value of sin (15°) using compound angles.

(c) Find the intercepts of the line $2x + 3y = 6$ on both the axes.

(d) State whether the function is even or odd if, $f(x) = x^3 + 4x + \sin x$.

(e) At which point on the curve $y = 3x - x^2$ the slope of the tangent is –5 ?

(f) Divide 100 into two parts such that their product is maximum.

(g) If mean is 34.5 and standard deviation is 5, find the co-efficient of variance.

2. Attempt any THREE of the following : 12

(a) If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$, then

Find the matrix 'X' such that

$2X + 3A - 4B = I$, where I is identity matrix of order 2.

(b) If $A = \begin{bmatrix} -2 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 3 & 5 \\ 0 & 2 \end{bmatrix}$, whether AB is singular or non-singular matrix ?

(c) Resolve into partial fraction $\frac{3x-2}{(x+2)(x^2+4)}$.

(d) If A and B are obtuse angle and $\sin A = \frac{5}{13}$ and $\cos B = \frac{-4}{5}$, then find

$\sin (A + B)$.

3. Attempt any THREE of the following : 12

(a) Prove that, $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$

(b) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$.

(c) Find the equation of straight line passing through the point of intersection of lines $4x + 3y = 8$ and $x + y = 1$; and parallel to the line $5x - 7y = 3$.

(d) Find $\frac{dy}{dx}$, if $x^3 + xy^2 = y^3 + yx^2$.

4. Attempt any THREE of the following : 12

(a) If $x = a(\theta + \sin\theta)$ & $y = a(1 - \cos\theta)$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{2}$.

(b) If $y = (x)^{\sin x} + (\tan x)^x$, find $\frac{dy}{dx}$.

(c) Find the range and co-efficient of range for the following data :

Class Interval	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59
Frequency	15	25	13	17	10

(d) Calculate the mean deviation about mean of the following data :

17, 15, 18, 23, 25, 22, 11, 5

(e) The following data pertains to two workers doing the same job in a factory :

Details	**Worker A**	**Worker B**
Mean time of completing job	40	42
Standard deviation	8	6

Who is more consistent worker ?

5. Attempt any TWO of the following : **12**

(a) Solve the following system of equations by matrix inversion method :

$x + y + z = 3,\ 3x - 2y + 3z = 4,\ 5x + 5y + z = 11$

(b) (i) If $\tan\left(\frac{A}{2}\right) = \frac{1}{\sqrt{3}}$, find the value of cos A.

(ii) Evaluate without using calculator

$$\frac{\tan 85° - \tan 40°}{1 + \tan 85° \cdot \tan 40°}$$

(c) (i) Find the distance between the parallel lines $3x + 2y = 5$ and $3x + 2y = 6$.

(ii) Find the acute angle between the line, $3x = y - 4$ and $2x + y + 3 = 0$.

6. Attempt any TWO of the following : **12**

(a) A manufacturer can sell 'x' items at a price of ₹ $(330 - x)$ each. The cost of producing x items in ₹ $(x^2 + 10x + 12)$. Determine the number of items to be sold so that the manufacturer can make the maximum profit.

(b) A beam is bent in the form of curve $y = 2 \sin x - \sin 2x$. Find radius of curvature of the beam at $x = \frac{\pi}{2}$.

(c) Find mean, standard deviation and co-efficient of variance of the following data :

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15

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23242

3 Hours / 70 Marks Seat No. | | | | | | | | |

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Marks

1. Attempt any FIVE : **10**

(a) Find the value of $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$.

(b) Without using calculator, find the value of cos (135°).

(c) If $f(x) = x^3 - \frac{1}{x^3}$, show that $f(x) + f\left(\frac{1}{x}\right) = 0$.

(d) State whether the function $f(x) = \frac{e^x + e^{-x}}{2}$ is even or odd.

(e) Find $\frac{dy}{dx}$ if $y = x^2e^x$.

(f) Find range & coefficient of range for the runs scored by cricket player in eight innings 45, 42, 39, 40, 48, 41, 45, 44.

(g) If mean is 34.5 & S.D. (σ) is 5, find C.V. (Coefficient of Variance).

2. Attempt any THREE : 12

(a) If $P = \begin{bmatrix} 1 & 2 & -3 \\ 3 & -1 & 2 \\ -2 & 1 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$, then find matrix R such that $P + Q + R = 0$.

(b) Resolve into partial fraction $\frac{x^2 - 2x + 3}{(x+2)(x^2+1)}$.

(c) Without using calculator, find the value of $\sin 150° + \cos 300° - \tan 315° + \sec^2 360°$.

(d) Find mean deviation from mean for the data :

17, 15, 18, 23, 25, 22, 11, 5

3. Attempt any THREE : 12

(a) Prove that $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$.

(b) Prove that $\sqrt{2 + \sqrt{2 + \cos 4\theta}} = 2 \cos \theta$.

(c) Show that $\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{1}{3}\right)$.

(d) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$, then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.

4. Attempt any THREE : 12

(a) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$,.

show that AB is singular or non-singular matrix.

(b) Find $\frac{dy}{dx}$ if $y = (\sin x)^x$.

(c) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4xy$.

(d) Find $\frac{dy}{dx}$ if $y = \tan^{-1}\left(\frac{a+x}{1-ax}\right)$.

(e) A metal wire 36 cm long bent to form a rectangle. Find its dimensions when area is maximum.

5. Attempt any TWO : **12**

(a) (i) Find the equation of straight line passes through the points (–4, 6) & (8, –3).

(ii) Find the equation of line passing through (2, 5) & through the intersection of lines $x + y = 0$ & $2x - y = 9$.

(b) (i) Find the angle between the lines $x + 5y = 11$ & $5x - y = 11$.

(ii) Find the perpendicular distance of the point (–3, 4) from the line $4(x + 2) = 3(y - 4)$.

(c) (i) A beam is bent in the form of curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature of beam at point $x = \frac{\pi}{2}$.

(ii) Find the equation of tangent to the curve $4x^2 + 9y^2 = 40$ at (1, 2).

6. Attempt any TWO : **12**

(a) Using matrix-inversion method, solve the following system of equations :

$x + y + z = 6$; $3x - y + 3z = 10$; $5x + 5y - 4z = 3$

(b) (i) Find mean of the following distribution :

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No. of Students	5	8	15	16	6

(ii) An analysis of monthly wages paid to the workers in two firms A & B belonging to the same industry gives following data :

	Firm-A	Firm-B
Average monthly wages (in ₹)	186	175
Variance of distribution of wages (in ₹)	81	100

Which firm is more consistent ?

(c) Calculate mean and standard deviation and coefficient of variation of the following data :

C.I.	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15

HUMANITIES AND SCIENCE DEPARTMENT

Winter-23 preliminary Examination

Course Name	Computer Engineering	**Date**	___/___/2023
Course Code	CO1K	**Semester**	First
Subject name	Basic Mathematics	**Subject code**	311302
Marks	70 Marks	**Time**	03 Hour

Instructions :

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1. Attempt any FIVE of the following : **Marks 10**

1) *Find* x, *if* $log3\ (x + 5) = 4$.

2) *Without using calculator find the value of* $cos(75°)$.

3) *If mean is* 34.5 *&standard deviation is* 5. *Find the coefficient of variance.*

4) *Find the range & coefficient of range for the data :* 45, 42, 39, 40, 48, 41, 45, 44.

5) *If* $y = 2x + cos(3x)$. *Find* dx/dy.

6) *Find the equation of straight line passing through points* (3,5), (4,6)

7) *Show that the matrix* $\begin{bmatrix} -2 & 3 \\ 4 & -6 \end{bmatrix}$ *is singular*

P.T.O

Q. 2 Attempt any THREE **12**

1. Prove that $\sqrt{2+\sqrt{2+2\cos 4\theta}} = 2\cos\theta$

2. Without using calculator fint the value of :

$$\sin 150° + \cos 300° - \tan 315° + sec^2 3660°$$

3. Resolve into partial fractions: $\frac{2x+3}{x^2-2x-3}$

4. If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$ check whether AB is singular or not?

Q. 3 Attempt any THREE **12**

1. Resolve into partial fractions: $\frac{x^2-2x+3}{(x+2)(x^2+1)}$

2. If $x^2 + y^2 = 4xy$ find $\frac{dy}{dx}$

3. Calculate mean & S. D. of the following data: 1, 2, 3, 4, 5, 6, 7, 8, 9

4. Prove that : $\cos 2\theta = \cos^2\theta - \sin^2\theta$ and hence verify for $\theta = 30°$

Q. 4 Attempt any THREE **12**

a. If α & β both are obtuse angles & $\sin\alpha = 5/13$, $\cos\beta = -4/5$, find $\cos(\alpha + \beta)$

b. If $x = a\cos\theta, y = a\sin\theta$. Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$

c. Prove that : $\cos^{-1}\left(\frac{4}{5}\right) - \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{63}{65}\right)$

d. Find the equation of tangent to the curve $y = x^2 - x - 6$ at point $(3, 0)$

e. If $y = \log[\log(\log x)]$. Find $\frac{dy}{dx}$

Q. 5 Attempt any TWO **12**

1. i) Find length of the perpendicular from the point (5, 6) on the line $2x + y + 6 = 0$.

ii) Find the acute angle between the lines $3x - y = 4, 2x + y = 3$.

2. i) *Find the equation of line passing through the point* $(-3, 2)$ *& having slope* $5/2$.

ii) *Find distance between parallel lines* $3x + 2y - 5 = 0$ *and* $3x + 2y - 6 = 0$.

3. *A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.*

Q. 6 Attempt any TWO **12**

A) *Calculate the mean, standard deviation & coefficient of variance of the following data :*

Class interval	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
Frequency	6	7	12	19	21	18	11	6

b) i) *Find the range & coefficient of range for the following data :*

C. I.	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	10	15	16	20	21	22	9	8

ii) The following data pertain to two workers doing the same job in a factory.

	Worker A	Worker B
Mean	40	42
S. D.	8	6

Who is more consistent ?