MATHEMATICS

The Question Paper consists of ***two*** *sections A and B. Candidates are required to attempt all questions from* ***Section A*** *and all questions from* ***Section B.***

Section A : Internal choice has been provided in two questions of two marks each, two questions of four marks each and two questions of six marks each.

Section B : Internal choice has been provided in one question of two marks and one question of four marks.

SECTION A(65 MARKS)

Question 1

(i) Derivative of cos 7x **[1]**

(a) -7 sin 7x (b) -7 sin 7x (c) -7 cos 7x (d) 7 cos 7x

(ii) The range of x for which $x^2 - 4x + 3 < 0$ is **[1]**

(a) $1 \leq x \leq 3$ (b) $1 < x \leq 3$ (c) $1 \leq x < 3$ (d) $1 < x < 3$

(iii) Derivative of tan (3x + 1) **[1]**

(a) $\sec^2(3x + 1)$ (b) $-\sec(3x + 1)$ (c) $3\sec^2(3x + 1)$ (d) $-3\sec(3x + 1)$

(iv) Evaluate: $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$ **[1]**

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

(v) Find the derivative of $x^2 + 1$ with respect to x : **[1]**

(a) 2x (b) 2x + 1 (c) 2 (d) 1

(vi) Out of 26 cards numbered from 1 to 26 , one card is chosen . The probability that it is not divisible by 4 is : **[1]**

(a) 5/26 (b) 10/13 (c) 2/3 (d) 11/15

(vii) The number of terms in the expansion of $[(x - 2y)^3]^3$ is : **[1]**

(a) 6 (b) 9 (c) 4 (d) 10

(viii) In triangle ABC , if a = 2 , b = 3 and c = 4 , then cos A is : **[1]**

(a) 7/8 (b) 8/7 (c) 5/8 (d) 8/5

(ix) A book contains 100 pages . A page is chosen at random . The chance that the sum of the digits on the page is equal to 9 is : **[1]**

(a) 1/10 (b) 11/100 (c) 1/5 (d) 9/100

(x) In any triangle ABC , a (b cos C - c cos B) is equal to : **[1]**

(a) $a^2 - b^2$ (b) $b^2 - a^2$ (c) $c^2 - b^2$ (d) $b^2 - c^2$

(xi) Find the equation of the circle whose centre is (4, 5) and radius is 7. **[1]**

(xii) Find the slope of a line parallel to a line whose slope is 1/2 . **[1]**

(xiii) A bag contains 4 red , 6 white and 5 black balls . 2 balls are drawn at random . Find **[1]**

the probability of getting one red and one white ball .

(xiv) Find the sixth term of $\left(2x-\frac{1}{x^2}\right)^7$ **[1]**

(xv) Two dice are tossed once . Find the probability of getting an even number on the first die or a total of 8 . **[1]**

Question 2

(a) Find $\frac{dy}{dx}$ if $y=(3x^4+2x-11)(1-2x)$ **[2]**

OR

(b)Find $\frac{dy}{dx}$ if $y=5x^3\sqrt{7-2x}$

Question 3

Evaluate: $\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x}$ **[2]**

Question 4

(a) Find the distance of a point P(-2, 3) from the line x - y - 5 = 0. **[2]**

OR

(b) Two dice are thrown together . What is the probability that the sum of the numbers on two faces is neither 9 nor 11 ?

Question 5

In a triangle ABC , a = 2 , b = 3 and sin A = 2/3 . Find < B . **[2]**

Question 6

Find the middle term of $\left(2x-\frac{1}{y}\right)^8$. **[2]**

Question 7

Solve the inequation on $\frac{x^2-3x+24}{x^2-3x+3}<4$ **[4]**

Question 8

(a) Evaluate: $\lim_{x\to 0}\frac{1-cosx}{x^2}$ **[4]**

OR

(b) Find the perpendicular distance between the lines 3x + 4y - 5 = 0 and 6x + 8y - 45 = 0.

Question 9

Prove by the principle of induction that : **[4]**

$$1.4.7+2.5.8+3.6.9+\cdots\ldots+n(n+3)(n+6)=\frac{n}{4}(n+1)(n+6)(n+7)$$

Question 10

(a) If a cos A = b cos B , then show that either the triangles is isosceles or right angled **[4]**

OR

(b) Use the principle of mathematical induction to prove the following statement .

$$1^2 + 2^2 + 3^2 + \cdots \ldots + n^2 = \frac{1}{6}n(n+1)(2n+1)$$

Question 11

(a)Find the derivative of tan x using first principle method. **[6]**

OR

(b)Calculate the standard deviation and variance for the following distribution.

x	4.5	14.5	24.5	34.5	44.5	54.5	64.5
f	1	5	12	22	17	9	4

Question 12

Find the equation of a circle passes through the points (1, 0), (3, 0) and (0, 2). **[6]**

Question 13

(a)Solve graphically : $2x - y \leq 2, 2x - y \geq 0$ **[6]**

OR

(b) Find the term independent of x in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^9$

Question 14

(a) (i) In a group there are 3 women and 3 men . 4 people are selected at random from this group . Find the probability that 3 women and 1 man or 1 woman and 3 men are selected . **[6]**

(ii) A card is drawn at random from a well shuffled pack of cards . What is the probability that it is a heart or a queen ?

OR

(b) In any triangle ABC , prove that :

$$\tan\left(\frac{B-C}{2}\right) = \frac{b-c}{b+c}\cot\frac{A}{2}$$

SECTION B(15 MARKS)

Question 15

(In sub-parts (i) to (iii) choose the correct options and in sub-parts (iv) and (v) answer the questions as instructed.)

(i) The equation of Z-axis is **[1]**

(a) x=0,y=0

(b) y=0,z=0

(c) x=0,z=0

(d) z=k

(ii) The distance from the origin to the point (12, 0,5) is **[1]**

(a) 17

(b) 13

(c) 5

(d) 12

(iii) Find the co-ordinates of a point which divides internally the points (1, 3, 7) and (6, 3, 2) in the ratio 2 : 3. **[1]**

(iv) Find the eccentricity of the ellipse whose semi axes are 5 and 4 . **[1]**

(v) What is the distance between the foci of the ellipse $5x^2 + 9y^2 = 45$? **[1]**

Question 16

(a) Draw the truth table of $\sim(p \Rightarrow q) \Rightarrow (q \Rightarrow p)$. **[2]**

OR

(b) Find the equation of the ellipse whose latus rectum is 8 and eccentricity is 1/3 .

Question 17

(a)Write the converse, inverse and contrapositive of the statement ' If y + 4 = 9, then y = 5'. **[4]**

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(b)Write the truth table for ~(pvr)⇒~(qvp).

Question 18

Find the equation of the ellipse whose foci are at the points (2,0) and (-2,0) and whose latus rectum is 6 . **[4]**

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