END SEMESTER/RETEST EXAMINATION–2019

Semester : 3rd (New)

Subject Code : Sc-303

MATHEMATICS-III

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. Questions on PART–A are compulsory.

2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

    (a) A differential equation is formed with _____ co-efficients.

(b) The order of a linear differential equation is _____.

(c) The degree of the differential equation
$[D^2 + D + 1]y = e^{-2x}$ is _____.

(d) Integrating factor of $x\dfrac{dy}{dx} + 2y = x^2$ is _____.

(e) The condition for Mdx+Ndy = 0 to be exact is _____.

(f) The Clairaut's equation is of the form _____.

(g) The Particular Integral of $[D^2 - 5D + 6]y = e^x$ is _____.

(h) The complementary function of $\dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 2y = e^{3x}$ is _____.

(i) The median of the observations: 32, 28, 31, 15, 10, 33, 38, 52, 43, 40 is _____.

(j) The sample space in the toss of a dice is _____.

2. Write true or false :   1×10=10

(a) The physical problem related to $\dfrac{d^2x}{dt^2} + \omega^2 x = 0$ is called simple harmonic motion.

(b) $f_x(x,y)$ is the partial derivative of $z = f(x, y)$ with respect to y .

(c) $y = A \cos x + B \sin x$ is a solution of the differential equation $\dfrac{d^2y}{dx^2} + y = 0$.

(d) If A is a singular matrix, then $|A| \neq 0$.

(e) A Linear Differential Equation reducible to homogeneous form is called an Exact Equation.

(f) The feasible region contains the solution of LPP.

(g) Diagrammatic representation of bivariate data is called Scatter Diagrams.

(h) Variance is related to mean deviation.

(i) Only a square matrix can have Adjoint of it.

(j) If there is negative correlation between two variables then they are said to be independent.

3. Choose the correct answer : 1×5=5

(a) The cumulative frequency is required to calculate

 (i) Mean   (ii) Median

 (iii) Mode   (iv) None of these

(b) The number of independent variables in a partial differential equation is,

 (i) one   (ii) more than one

 (iii) more than two (iv) None of these

(c) The solution of $\cos x = \dfrac{1}{2}$, $0 \le x \le \dfrac{\pi}{2}$ is,

 (i) $\dfrac{\pi}{4}$ (ii) $\dfrac{\pi}{2}$

 (iii) $\dfrac{\pi}{3}$ (iv) $\dfrac{\pi}{6}$

(d) Two points belonging to the solution set of $2x - 3y \le 1$ are,

 (i) (2,0),(3,0)   (ii) (0,2),(1,0)

 (iii) (0,0),(3,1)   (iv) (0,0),(2,1)

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(e) The graphs of the equation $x \tan x = 1$ are

 (i) curves

 (ii) straight lines

 (iii) both curve and straight line

 (iv) None of the above.

PART – B

Marks – 45

4. Answer the following : 3×3=9

(a) Find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$: $z = x^y + y^x$

(b) Form a differential equation :
$y^2 = Ax^2 + Bx + C$

(c) Find the first order partial derivative of $ax^2 + 2hxy + by^2$

5. Solve the following : 3×3=9

(a) $(x^2 + x + 1)dx + (y^2 + y + 1)dy = 0$

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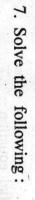
(b) $\dfrac{dy}{dx} = \dfrac{y}{x} + \cot\dfrac{y}{x}$

(c) $(x+y+1)dx = (2x+2y+1)dy$

6. Answer the following : $\qquad$ 3×3=9

(a) Solve: $\dfrac{dy}{dx} + \dfrac{x+1}{x}y = \dfrac{1}{x}$

(b) Prove that $(x-2e^y)\,dy + (y - x\sin x)\,dx = 0$ is exact and find the solution.

(c) $y = px + \dfrac{a}{p}$

7. Solve the following : $\qquad$ 3×3=9

(a) $p^2 - 5p + 6 = 0$

(b) $\dfrac{d^2 y}{dx^2} - 8\dfrac{dy}{dx} + 15y = 0$

(c) $(D^2 - 4)y = e^{2x}$

8. Answer the following : $\qquad$ 6+3=9

(a) Find the Mean and Mode from the following data :

Class :	0–10	10–20	20–30	30–40
Freq. :	3	5	7	9

Class	40–50	50–60	60–70
Freq. :	4	3	4

(b) Draw the graph of $y = \sin x$, $-\pi \le x \le \pi$

9. Answer the following : $\qquad$ 5+4=9

(a) Find the Quartile Deviation of the following distribution :

Class :	0–10	10–20	20–30	30–40
Freq :	15	20	25	24

Class :	40–50	50–60	60–70	70–80
Freq :	12	31	71	52

(b) Solve graphically :

$$\cos x = 2x, \quad 0 \le x \le \dfrac{\pi}{2},$$

10. Answer the following : 5+4=9

(a) Find the Mean and Standard Deviation of the following data :

x :	2	2.5	3.0	3.5
f :	5	38	65	92

(b) Find the inverse of $\begin{pmatrix} 1 & -3 & 4 \\ -1 & 1 & 0 \\ 0 & 2 & -1 \end{pmatrix}$

x :	4.0	4.5	5.0
f :	70	40	10

(c) Solve the simultaneous linear equations :

$3x-y+2z+2=0$; $x+2y+z-1=0$;

$5x+3y+2z-4=0$.

(b) Calculate the co-efficient of correlation for the following heights (in inches) of fathers and their sons :

x :	65	66	67	67
y :	67	68	65	68

x :	68	69	70	72
y :	72	72	69	71

12. Answer the following : 4+5=9

(a) Solve : $3x+y \geq 4$, $x \geq 1$, $y \geq 0$

(b) Maximise : $z = 120x + 80y$

Subject to constraints : $2x+y \leq 6$;

$7x + 8y \leq 30$; $x \geq 0$; $y \geq 0$.

11. Answer the following : 2+3+4=9

(a) Find the transpose of

$\begin{pmatrix} 1 & 3 & 0 \\ -1 & 3 & 2 \\ 2 & 2 & 1 \end{pmatrix}$

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