END SEMESTER/ RETEST EXAMINATION, 2020

(New Syllabus / Old Syllabus)

Semester: 3rd

Subject code: Sc 303

Subject: Mathematics-III

Full Marks: 70 (part A- 25 + Part B-45)

Duration: 3 hours

Questions on Part A are compulsory

PART-A **MARK-25**		
Question no.	**Questions**	**Marks**
Question 1	1(a) Degree of the equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}+5y=0$ is _____. 1(b) Order of the equation $\left(\frac{d^2y}{dx^2}\right)^3+\left(\frac{d^2y}{dx^2}\right)^2+\left(\frac{dy}{dx}\right)^4+y^2=x$ _____. 1(c) Solution of $xdx+ydy=0$ is _____. 1(d) Equations reducible to homogeneous form is _____. 1(e) An ordinary differential equation of the 1st order and 1st degree may be expressed in the form _____.	1x5=5
Question 2	2(a) What is the integrating factor of linear equation? 2(b) What is Bernoulli's Equations? 2(c) What is the general solution of $y=px+p^2$? 2(d) What is Singular solution of equation $y=px+p-p^2$? 2(e) What is the form of Clairaut's equation?	1x5=5
Question 3	**Write true or false** 3(a) The general differential equation of the form	1x5=5

	$P_0\frac{d^n y}{dx^n}+P_1\frac{d^{n-1}y}{dx^{n-1}}+P_2\frac{d^{n-2}y}{dx^{n-2}}+\ldots\ldots\ldots+P_n y=X^n$ 3(b) Sol Solution of $(D^2+4D+4)y=0$ is $y=Ae^x+Be^{-x}$ 3(c) Complementary function of $(D^2-5D+6)y=e^x\sin x$ is $Ae^{2x}+Be^{3x}$ 3(d) Formula for Median is $l+\frac{\frac{N}{4}-F}{f}\times i$ 3(e) Formula for Standard Deviation is $\sqrt{\frac{\sum fd^2}{N}+\left(\frac{\sum fd}{N}\right)^2}$	
Question 4	Find True or False 4(a) Median of 32, 28, 31, 53, 20, 33, 38, 56, 43, 40 is 33. 4(b) Coefficient of Quartile Deviation is $\frac{Q_3-Q_1}{Q_3+Q_1}$ 4(c) A bag contains 7 red and 8 black balls, the probability of drawing a red ball is $\frac{7}{15}$ 4(d) If two dice are thrown together, the required probability of getting a total of 7 is $\frac{1}{6}$ 4(e) If E_1 and E_2 are independent events then $P(E_1E_2)=P(E_2).P\left(\frac{E_1}{E_2}\right)$	1x5=5
Question 5	**Choose the correct answer:** 5(a) Adjoin of $\begin{pmatrix}1&0&2\\2&1&0\\3&2&1\end{pmatrix}$ is (i) $\begin{pmatrix}1&4&-2\\-2&-5&4\\1&-2&1\end{pmatrix}$ (ii) $\begin{pmatrix}1&2&3\\0&1&2\\2&0&1\end{pmatrix}$ (iii) $\begin{pmatrix}1&-2&1\\4&-5&-2\\-2&4&1\end{pmatrix}$ (iv) $\begin{pmatrix}1&0&0\\0&1&0\\0&0&1\end{pmatrix}$ 5(b) 2nd order identity matrix is	1x5=5

	$(i)\begin{pmatrix}1 & 1\\ 1 & 1\end{pmatrix}$ $(ii)\begin{pmatrix}1 & 1\\ 1 & 0\end{pmatrix}$ $(iii)\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$ $(iv)\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$ 5(c) Characteristic roots of $\begin{pmatrix}1 & 2 & -3\\ 0 & 3 & 2\\ 0 & 0 & -2\end{pmatrix}$ are (i)1, 3, -2 (ii) 1, 1, 5 (iii) 1, 2, -3 (iv) -3, 2, -2 5(d) (4,0) is a solution of $(i)2x-y<1$ $(ii)x+y\geq 6$ $(iii)x+y\geq 4$ $(iv)x+y>4$ 5(e) (1,6) is a solution of $(i)x-y<1$ $(ii)2x-3y\geq 6$ $(iii)x+y\geq 8$ $(iv)3x+y>9$	

(Part B)

Answer any five questions

Question no.	Questions	marks
QUESTION 6		3+3+3=9
6a	Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ where $z=x^2+y^2$	
6b	If $u=\frac{y}{z}+\frac{z}{x}+\frac{x}{y}$ prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0.$	
6c	Form differential equation: $y=Ae^{2x}+Be^{3x}$	
Question no.7	**Solve:**	3+3+3=9
7a	$(1+x^2)dy-xydx=0$	
7b	$(x-2e^y)dy+(y-x\sin x)dx=0$	
7c	$y=-px+x^4p^2$	
Question no. 8		3+3+3=9
8a	**Solve:** $y=x\frac{dy}{dx}+\sqrt{\left(\frac{dy}{dx}\right)^2-1}$	
8b	Solve: $\frac{d^2y}{dx^2}+9y=e^{-3x}$	

8c	**Solve:** $\frac{dy}{dx} = \frac{x+y+1}{2x+2y-3}$	
Question 9		3+3+3=9
9a	A resistance of 100 ohms, an inductance of 0.5 henry are connected in series with a battery of 20 Volts. Find the current in the circuit as a function of time.	
9b	Find the Mean deviation from Median from the following data 90, 100, 125, 115, 110.	
9c	Find the Mode of the following frequency distributions: Class interval : 0-10 10-20 20-30 30-40 40-50 Frequency : 7 8 20 10 5	
Question 10		3+3+3=9
10a	Find the Standard Deviation (SD) of the following data Class: 0-6 6-12 12-18 18-24 24-30 Frequency: 8 10 12 9 5	
10b	(i) Ten students got the following percentage of marks in Physics and Mathematics: Phy : 72 42 99 32 76 85 90 60 67 43 Maths: 82 50 91 54 68 60 80 55 53 47 Calculate the coefficient of correlation. (ii) From a pack of cards two cards are drawn at random. Find the probability that they are red cards.	
Question 11		3+3+3=9
11a	(i) Draw the graph of $y = Sinx, -\pi \le x \le \pi$ (ii) Solve graphically: $Sin2x = Cosx,\ 0 \le x \le 90^0$	
11b	Show that $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ satisfies the matrix equation $A^2 - 4A - 5I = 0.$	
Question 12	(i) Solve the Simultaneous linear equation $x + y + z = 6$ $x + 2y + 3z = 10$ $x + 2y + 4z = 1$ (ii) Maximise $z = -3x + 4y$ Subjected to $x + 2y \le 8,\ 3x + 2y \le 12,\ x \ge 0, y \ge 0$	5+4=9

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