17/08/23
Special exam.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

4/8/23

Special

~~End Semester~~ Examination

Max. Marks: 100 | Duration: 3 Hrs
Class: Direct Second Year | Semester: III
Course Code: MA202 | Branch: ALL
Name of the Course: Foundation of Mathematics-I

Instructions:
(1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Use of scientific calculator is allowed.

Q NO.		Max Marks	CO
Q.1	(A) Resolve into partial fractions $\frac{(x+4)}{(x-1)^2(x+1)}$	05	CO 1
	(B) Find $\frac{dy}{dx}$ if $y = \frac{e^x+e^{-x}}{e^x-e^{-x}}$	05	CO 1
	(C) I If $u = sin^{-1}(\frac{x}{y})$, prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$	05	CO 1
	(D) Use the properties of determinants and without expanding evaluate $\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix}$	05	CO 6
Q.2	(A) If $y = (x^2-1)^n$, prove that $(x^2-1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$	07	CO 3
	(B) Discuss maxima and minima of $x^3 + 3xy^2 - 3x^2 + 4$	07	CO 2
	OR		
	Discuss maxima and minima of $u = xy + a^3(\frac{1}{x} + \frac{1}{y})$		
	(C) Prove that $xcosecx = 1 + \frac{x^2}{6} + \frac{7x^4}{360} + \ldots\ldots\ldots$	06	CO 4
Q.3	(A) If $z = f(x,y), x = \log u$, $y = \log v$, prove that $\frac{\partial^2 z}{\partial x \partial y} = uv\frac{\partial^2 z}{\partial u \partial v}$	07	CO 1
	(B) Find inverse of a matrix by adjoint method for $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 3 \\ 2 & 1 & 2 \end{bmatrix}$	07	CO 5

	(C) Prove that $\log(secx) = \frac{x^2}{2} + \frac{x^4}{12} + \frac{x^6}{45} + \cdots$ OR Expand in powers of x, $e^x secx$	**06**	CO 4
Q.4	(A) If $u = f(2x - 3y, 3y - 4z, 4z - 2x), and\ u = f(l, m, n)$ prove that $$\frac{1}{2}\frac{\partial u}{\partial x} + \frac{1}{3}\frac{\partial u}{\partial y} + \frac{1}{4}\frac{\partial u}{\partial z} = 0$$	**06**	CO1
	(B) If A $= \begin{bmatrix} 1 & -2 & 3 \\ 2 & 1 & 3 \\ 0 & 2 & -1 \end{bmatrix}$ then find the value of $A^3 + 8A^2 + 7A + 2I$ OR Verify whether $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is orthogonal or not	**06**	CO5
	(C) a) Find the dot product and cross product of the vector from $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ to $\vec{b} = \hat{\imath} - 4\hat{\jmath} + 2\hat{k}$	**04**	CO6
	b) Show that the vectors $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $-4\hat{\imath} + 6\hat{\jmath} - 8\hat{k}$ are collinear	**04**	CO6
Q.5	(A) Calculate the value of $\sqrt{10}$ to four values of decimals by using Taylor's Theorem OR Apply Taylor's Theorem to find approximately the value of f(11/10) where $f(x) = x^3 + 3x^2 + 15x - 10$	**07**	CO4
	(B) Find the nth derivative of $y = \frac{(x-1)}{(x+1)(2x+3)}$	**06**	CO3
	(C) If x = u + v + w , y = uv + vw + wu , z = uvw , prove that $x\frac{d\emptyset}{dx} + 2y\frac{d\emptyset}{dy} + 3z\frac{d\emptyset}{dz} = u\frac{d\emptyset}{du} + v\frac{d\emptyset}{dv} + w\frac{d\emptyset}{dw}$	**07**	CO2

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☺ ALL THE BEST ☺