Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India
(Autonomous College Affiliated to University of Mumbai)

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 $\frac{(x-4)}{(x-2)(x-3)(x-1)}$	05	CO 1
	(B) Find $\frac{dy}{dx}$ if $y = \frac{\sqrt{x}+1}{\sqrt{x}-1}$	05	CO 1
	(C) I If $z = x^y + y^x$, then verify whether $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$	05	CO 1
	(D) Find the direction cosines of the vector joining the points A (1, 2, -1) and B (-2, -2,3) directed from A to B	05	CO 6
Q.2	(A) If $y = e^{m \sin^{-1} x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$	08	CO 3
	(B) Discuss maxima and minima of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ **OR** Discuss maxima and minima of $x^4 + y^4 - x^2 - y^2 + 1$	08	CO 2
	(C) Prove that $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} + \ldots\ldots\ldots$	04	CO4
Q.3	(A) If $u = f(x^2 - y^2, y^2 - z^2, z^2 - x^2)$ then prove that $\frac{1}{x}\frac{\partial u}{\partial x} + \frac{1}{y}\frac{\partial u}{\partial y} + \frac{1}{z}\frac{\partial u}{\partial z} = 0$	07	CO 1
	(B) Find inverse of a matrix by adjoint method for $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 1 & 4 \\ 3 & 1 & 1 \end{bmatrix}$	07	CO 5
	(C) Write the standard series for tan x **OR** Expand in powers of x, e^{xcosx} up to x^3	06	CO1

Q.4	(A) If $u = f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, prove that $$x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z} = 0$$	**06**	CO1
	(B) If $A = \begin{bmatrix} 1 & 3 & 3 \\ 2 & 2 & 4 \\ 3 & 2 & -1 \end{bmatrix}$ then find the value of $15A^2 - 7A - 6I$ **OR** Verify whether $A = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 4 & 1 \\ 0 & 5 & 1 \end{bmatrix}$ is singular or not	**06**	CO5
	(C) a) Find the dot product and cross product of vector directed from $\vec{A} = -2\hat{\imath} + 2\hat{\jmath} + \hat{k}$ to $\vec{B} = 2\hat{\imath} + 4\hat{\jmath} - 3\hat{k}$	**04**	CO6
	b) Show that the vectors $3\hat{\imath} - 3\hat{\jmath} - 2\hat{k}$ and $-6\hat{\imath} + 6\hat{\jmath} + 4\hat{k}$ are collinear	**04**	CO6
Q.5	(A) Calculate the value of $\sqrt{25.15}$ to four values of decimals by using Taylor's Theorem **OR** Apply Taylor's Theorem to find approximately the value of f (2.1) where $f(x) = x^3 - 3x^2 + 4x + 3$	**06**	CO4
	(B) Find the nth derivative of $y = cosxcos2xcos3x$	**07**	CO3
	(C) Using properties of determinants show that $$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$	**07**	CO3

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☺ ALL THE BEST ☺