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: 60 | Duration: 2 Hrs
Class: FE | Semester: I
Course Code: MA101 | Branch: ETRX/EXTC/IT/COMPS
Name of the Course: Engineering Calculus

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) If $u = f\left(\frac{x-y}{xy}, \frac{z-x}{zx}\right)$, find the value of $x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z}$.	**05**	CO 1
	(B) Find n-th derivative of $\frac{x^2}{(x+3)(3x+2)}$.	**05**	CO 3
	(C) Evaluate $\int_{-\infty}^{0} \frac{e^{\frac{1}{x}}}{x^2} dx$.	**05**	CO5
Q.2	(A) If $y = \frac{sin^{-1}x}{\sqrt{1-x^2}}$ then show that $y = x + \frac{2}{3}x^3 + \frac{2\times4}{3\times5}x^5 + \cdots$	**08**	CO 4
	(B) Find the minimum and maximum values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.	**07**	CO 2
	OR		
	Find the point on the plane $2x + y - z - 5 = 0$ which is nearest to the origin using Lagrange's multiplier method. Also find its minimum distance.		
Q.3	(A) Prove that $\int_0^{\infty} \frac{e^{2mx}+e^{-2mx}}{(e^x+e^{-x})^{2n}} dx = \frac{1}{2}\beta(m+n, n-m)$.	**08**	CO 5
	(B) Evaluate $\int_0^2 \int_{\sqrt{2x}}^2 \frac{y^2}{\sqrt{y^4-4x^2}}\, dydx$.	**07**	CO 5

Q.4	(A) Evaluate $\int_0^\infty e^{-\left(x^2+\frac{a^2}{x^2}\right)}dx = \frac{\sqrt{\pi}}{2}e^{-2a}, \quad a > 0.$ Hence, evaluate $\int_0^\infty e^{-\left(x^2+\frac{1}{x^2}\right)}dx.$	**05**	CO 5
	(B) Change to polar co-ordinates and evaluate $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2+y^2}}\, dxdy$. **OR** Evaluate $\int_0^{ln2} \int_0^x \int_0^{x+y} e^{x+y+z} dzdydx$.	**05**	CO 5
	(C) Find the area enclosed by the curves $y = e^x, y = x^2 - 1$ and the lines $x = -1$ and $x = 1$.	**05**	CO 6

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😊 ALL THE BEST 😊