Exam Code 1191

APRIL-MAY 2025 EXAMINATION
I B.TECH EXAMINATION
MA 10011 MATHEMATICS-I

Time: 3 Hrs.] [Max. Marks:70

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all the questions. All questions carry equal marks. Each question carries five subparts a, b, c, d and e. Attempt subparts a, b, c and any one from d or e in each question.

			MARKS	CO	BL	PI
Q.1	(a)	Verify that $\omega_{xy} = \omega_{yx}$ when $\omega = xy^2 + x^2y^3 + x^3y^4$.	02	CO1	2	2.1.3
	(b)	Find $\frac{dy}{dx}$ for the given implicit function $f(x,y) = x\,Sin\,(x-y) - (x+y) = 0$	02	CO1	2	2.1.3
	(c)	Verify $JJ^* = 1$ for the functions $x = u, y = u\,tanv, z = w$.	03	CO1	2	2.1.3
	(d)	Find the degree of the function $u = tan^{-1}\left(\frac{y^2}{x}\right)$ and then prove that $(i)\; x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}Sin\,2u$ $(ii)\; x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x\partial y} + y^2\frac{\partial^2 u}{\partial y^2} = -Sin^2u\,Sin2u$	07	CO1	2	2.1.3
		OR				
	(e)	Obtain Taylor's expansion of $tan^{-1}\left(\frac{y}{x}\right)$ about $(1,1)$ upto and including second degree terms. Hence compute $f(1.1, 0.9)$.	07	CO1	3	1.1.2
Q.2	(a)	Define extreme values and saddle point of a function.	02	CO2	1	1.1.1
	(b)	Find the radius of curvature at any point (s,ψ) of the curve $s = 8a\,Sin^2\frac{\psi}{6}$.	02	CO2	2	2.1.3
	(c)	Show that the equation of circle of curvature at the point $\left(\frac{a}{4},\frac{a}{4}\right)$ of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is $\left(x - \frac{3a}{4}\right)^2 + \left(y - \frac{3a}{4}\right)^2 = \frac{a^2}{2}$.	03	CO2	2	2.1.3
	(d)	Find the maximum value of $x^my^nz^p$ when $x + y + z = a$ using Lagrange's method of undetermined multipliers.	07	CO2	2	2.1.3
		OR				
	(e)	Find all the asymptotes of the curve $x^3 + 2x^2y - xy^2 - 2y^3 + 4y^2 + 2xy + y - 1 = 0$	07	CO2	2	2.1.3
Q.3	(a)	Prove that $n\beta(m+1,n) = m\beta(m,n+1)$.	02	CO3	2	2.1.3
	(b)	Evaluate $\Gamma(\frac{-5}{2})$.	02	CO3	2	2.1.3

	(c)	Evaluate $\int_0^\infty \frac{x^4(1+x^5)}{(1+x)^{15}}dx$.	03	CO3	2	2.1.3
	(d)	Evaluate $\iint r^3 dr d\theta$, over the area bounded between the circles $r = 2\cos\theta$ and $r = 4\cos\theta$.	07	CO3	2	2.1.3
		OR				
	(e)	Change the order of integration in the following integral and evaluate $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.	07	CO3	2	2.1.3
Q.4	(a)	Find the values of θ for which r attain its maximum and minimum values for the curve $r^2 = a^2\cos 2\theta$.	02	CO4	2	1.1.1
	(b)	Write down the formula to calculate area and length of the curve $y = f(x)$ between $x = a$ and $x = b$.	02	CO4	1	1.1.1
	(c)	Find the length of the arc f the parabola $y^2 = 8x$ cut off by its latus rectum.	03	CO4	2	1.1.1
	(d)	Trace the cardioid $r = a(1 - \cos\theta)$.	07	CO4	2	2.1.3
		OR				
	(e)	Show that the volume of the spindle solid generated by revolving the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ about the X-axis is $\frac{32\pi a^3}{105}$.	07	CO4	2	2.1.3
Q.5	(a)	The mean of 200 items was 50. Later on it was discovered that two items were misread as 92 and 8 instead of 192 and 88 respectively. Find out the correct mean.	02	CO5	3	1.1.1
	(b)	Write a short note on correlation.	02	CO5	1	2.4.1
	(c)	Find the Mode from the following data:	03	CO5	2	2.4.1

Age	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Frequency	6	11	25	35	18	12	6

	(d)	Fit a second degree Parabola to the following data:	07	CO5	2	2.4.1

X:	10	15	20	25	30	35	40
Y:	11	13	16	20	27	34	41

		OR				
	(e)	Calculate the Karl Pearson's Coefficient of correlation for the following data:	07	CO5	3	2.4.1

Roll no.	1	2	3	4	5	6	7	8	9	10
A:	78	36	98	25	75	82	90	62	65	39
B:	84	51	91	60	68	62	86	58	33	47

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