

Model Question Paper-I with effect from 2021 (CBCS Scheme)

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First Semester B.E Degree Examination Calculus and Differential Equations (21MAT11)

TIME: 03 Hours

Max. Marks: 100

Note: Answer any FIVE full questions, choosing at least ONE question from each MODULE.

Module -1			Marks
Q.01	a	With usual notations prove that $\tan \phi = r \frac{d\theta}{dr}$	06
	b	Find the angle between the curves $r = a(1 + \cos \theta)$ and $r = a(1 - \cos \theta)$	07
	c	Show that the radius of curvature at any point of the cycloid $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ is $4a \cos \left(\frac{\theta}{2}\right)$	07
OR			
Q.02	a	If p be the perpendicular from the pole on the tangent, then show that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4} \left(\frac{dr}{d\theta}\right)^2$	06
	b	Find the pedal equation of the curve $r^m = a^m (\cos m\theta + \sin m\theta)$	07
	c	Find the radius of curvature of the curve $x^3 + y^3 = 3axy$ at $\left(\frac{3a}{2}, \frac{3a}{2}\right)$	07
Module-2			
Q.03	a	Expand $e^{\sin x}$ by Maclaurin's series up to the term containing x^4	06
	b	If $u = f(2x - 3y, 3y - 4z, 4z - 2x)$, show that $6u_x + 4u_y + 3u_z = 0$	07
	c	Examine the function $f(x, y) = xy(1 - x - y)$ for extreme values	07
OR			
Q.04	a	Evaluate (i) $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}}$ (ii) $\lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$	06
	b	If $z = e^{ax+by} f(ax - by)$, show that $b \frac{\partial z}{\partial x} + a \frac{\partial z}{\partial y} = 2abz$	07
	c	If $x + y + z = u$, $y + z = uv$ and $z = uvw$, find $\frac{\partial(x, y, z)}{\partial(u, v, w)}$	07

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