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DEPARTMENT OF MATHEMATICS, M.S.R.I.T, BANGALORE-560054

Sub Code: MAT101 **Sub: Engineering Mathematics I** **Test: I**

Section: A - I **Term: 8-08-2016 to 17-12-2016** **Date: 3-10-2016**

Time: 11:00 to12:00 **Max. Marks: 30**

Note: Answer any two full questions.

Q. No.		Questions	Bloom's level	CO's	Marks
1.	(a)	Find $\frac{dy}{dx}$ for $y^x = x$ using partial derivative.	L1	CO1	(2)
	(b)	Find the angle made by the tangent at any point $P(r,\theta)$ on the curve $r^2 = a^2\cos 2\theta$.	L2	CO1	(3)
	(c)	Obtain the reduction formula for $I_n = \int_0^{\pi/2} sin^n(x)\ dx$ and hence evaluate I_5 and I_6	L3	CO2	(5)
	(d)	Examine the functional dependence of the functions $u = y+z$, $v = x+2z^2$ and $w = x-4yz-2y^2$. If they are dependent, find the relation between them.	L4	CO1	(5)
2.	(a)	If $u = \frac{x}{y+z} + \frac{y}{z+x} + \frac{z}{y+x}$ then what is the value of $xu_x + yu_y + zu_z$?	L1	CO1	(2)
	(b)	Evaluate $\int_0^{\pi/6} \sin^3(6\theta)\cos^4(3\theta)\ d\theta$	L2	CO2	(3)
	(c)	Trace the curve $x = a(\theta + sin\theta), y = a(1 - cos\theta)$	L4	CO2	(5)
	(d)	Show that the pedal equation of the curve $r^n = a^n \sin(n\theta) + b^n \cos(n\theta)$ is $p^2(a^{2n} + b^{2n}) = r^{2n+2}$	L5	CO1	(5)
3.	(a)	Find the tangents at the origin to the curve $y^2(1+x) = x^2(1-x)$	L1	CO2	(2)
	(b)	Show that at any point (r,θ), the tangent to the curve $r^n = a^n\sin(n\theta)$ makes an angle $(n+1)\theta$ with the initial line.	L2	CO1	(3)
	(c)	If $u = \tan^{-1}(\sqrt{x^4+y^4})$ then show that a) $xu_x + yu_y = \sin 2u$ b) $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} = \sin 4u - \sin 2u$	L3	CO1	(5)
	(d)	Prove that $\int_0^{2a} x^n\sqrt{2ax - x^2}\ dx = \pi a^2 \left(\frac{a}{2}\right)^n \frac{(2n+1)!}{(n+2)!\,n!}$	L5	CO1	(5)

Course Outcomes Assessed: CO1 & CO2