

Model Question Paper-II with effect from 2022 (CBCS Scheme)

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First Semester B.E Degree Examination

Mathematics-I for Electrical & Electronics Engineering Stream (22MATE11)

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 $\rho = \frac{(1+y_1^2)^{3/2}}{y_2}$	06
	b	Find the angle between the curves $r = a \log \theta$ and $r = \frac{a}{\log \theta}$	07
	c	Find the radius of curvature for the cardioids $r = a(1 + \cos \theta)$	07
OR			
Q.02	a	Show that the curves $r^n = a^n \cos n\theta$ and $r^n = b^n \sin n\theta$ cut each other orthogonally.	06
	b	Find the pedal equation of the curve $r^n = a^n \cos n\theta$	07
	c	Show that the radius of curvature at $(a, 0)$ on the curve $y^2 = \frac{a^2(a-x)}{x}$ is $\frac{a}{2}$	07
Module-2			
Q. 03	a	Expand $\sqrt{1 + \sin 2x}$ by Maclaurin's series upto the term containing x^5	06
	b	If $u = \tan^{-1}\left(\frac{y}{x}\right)$, where $x = e^t - e^{-t}$ and $y = e^t + e^{-t}$, find the total derivative $\frac{du}{dt}$ using partial differentiation	07
	c	If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$, show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$	07
OR			
Q.04	a	Evaluate (i) $\lim_{x \rightarrow 0} (a^x + x)^{\frac{1}{x}}$ (ii) $\lim_{x \rightarrow \frac{\pi}{2}} (\tan x)^{\tan 2x}$	06
	b	If $u = f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, show that $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} + z^2 \frac{\partial u}{\partial z} = 0$	07
	c	Find the maximum and minimum value of $x^3 + y^3 - 3axy$	07
Module-3			
Q. 05	a	Solve $\frac{dy}{dx} + y \tan x = y^3 \sec x$	06
	b	When a resistance R Ohms connected in series with an inductance L henries with an emf of E volts, the current i amperes at time t is given by $L \frac{di}{dt} + Ri = E$. If $E = 100 \sin t$ volts and $i = 0$ when $t = 0$, find i as a function of t.	07
	c	Solve $p^3 + 2xp^2 - y^2p^2 - 2xy^2p = 0$	07
OR			

Q. 06	a	Solve $(x^2 + y^3 + 6x)dx + y^2xdy = 0$	06
	b	Prove that the system of parabolas $y^2 = 4a(x + a)$ is self orthogonal	07
	c	Find the general and singular solution of $xp^2 + xp - yp + 1 - y = 0$	07
Module-4			
Q. 07	a	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyzdzdydx$	06
	b	Evaluate $\int_{-2}^2 \int_0^{\sqrt{4-x^2}} (2-x)dydx$	07
	c	Define beta and gamma functions and show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$	07
OR			
Q. 08	a	Evaluate by changing the order of integration $\int_0^a \int_0^{2\sqrt{ax}} x^2 dydx, a > 0$	06
	b	Evaluate $\int_0^1 x^{\frac{3}{2}}(1-x)^{\frac{1}{2}}dx$, by expressing in terms of beta and gamma functions	07
	c	Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$.	07
Module-5			
Q. 09	a	Find the rank of the matrix $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$	06
	b	Solve the system of equations by Gauss elimination method $3x + y + 2z = 3,$ $2x - 3y - z = -3,$ $x + 2y + z = 4$	07
	c	Using the Gauss-Seidel iteration method, solve the equations $83x + 11y - 4z = 9$ $3x + 8y + 29z = 71$ $7x + 52y + 13z = 104$ Carry out four iterations, starting with the initial approximations $(0, 0, 0)$	07
OR			
Q. 10	a	Test for consistency and solve $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$	06
	b	Using Gauss Jordan method, solve $x + y + z = 11$ $3x - y + 2z = 12$ $2x + y - z = 3$	07

	c	Find the largest eigenvalue and the corresponding eigenvector of $\begin{bmatrix} -2 & 0 & -1 \\ 1 & -1 & 1 \\ 2 & 2 & 0 \end{bmatrix}$ with the initial approximate eigenvector $[1 \ 1 \ 1]^T$	07
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Table showing the Bloom's Taxonomy Level, Course Outcome and Program Outcome					
Question		Bloom's Taxonomy Level attached	Course Outcome	Program Outcome	
Q.1	(a)	L1	CO 01	PO 01	
	(b)	L2	CO 01	PO 01	
	(c)	L3	CO 01	PO 02	
Q.2	(a)	L1	CO 01	PO 01	
	(b)	L2	CO 01	PO 01	
	(c)	L3	CO 01	PO 02	
Q.3	(a)	L2	CO 02	PO 01	
	(b)	L2	CO 02	PO 01	
	(c)	L3	CO 02	PO 02	
Q.4	(a)	L2	CO 02	PO 01	
	(b)	L2	CO 02	PO 01	
	(c)	L3	CO 02	PO 03	
Q.5	(a)	L2	CO 03	PO 02	
	(b)	L3	CO 03	PO 03	
	(c)	L2	CO 03	PO 02	
Q.6	(a)	L2	CO 03	PO 02	
	(b)	L3	CO 03	PO 03	
	(c)	L2	CO 03	PO 02	
Q.7	(a)	L2	CO 04	PO 02	
	(b)	L2	CO 04	PO 02	
	(c)	L2	CO 04	PO 01	
Q.8	(a)	L2	CO 04	PO 01	
	(b)	L2	CO 04	PO 02	
	(c)	L2	CO 04	PO 02	
Q.9	(a)	L2	CO 05	PO 01	
	(b)	L3	CO 05	PO 01	
	(c)	L3	CO 05	PO 02	
Q.10	(a)	L2	CO 05	PO 01	
	(b)	L3	CO 05	PO 01	
	(c)	L3	CO 05	PO 02	
Bloom's Taxonomy Levels	Lower order thinking skills				
	Remembering(knowledge):L ₁	Understanding Comprehension): L ₂		Applying (Application): L ₃	
	Higher order thinking skills				
	Analyzing (Analysis):L ₄	Valuating (Evaluation): L ₅		Creating (Synthesis): L ₆	