Model Question Paper –II with effect from 2022

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First Semester B. E Degree examination

Mathematics-1 for Computer Science Stream (22MATS11)

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 notation prove that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	6
	b	Find the angle between the curves$r = \frac{a}{1+cos\theta}$ and $r = \frac{b}{1-cos\theta}$	7
	c	Find the radius of curvature of the curve $y = x^3(x-a)$ at the point $(a, 0)$	7
		OR	
Q. 02	a	Show that the curves $r = a(1+\cos\theta)$ and $r = a(1-\cos\theta)$ cuts each other orthogonally	6
	b	Find the pedal equation of the curve $r(1 - cos\theta) = 2a$	7
	c	Find the radius of curvature for the curve $y^2 = \frac{a^2(a-x)}{x}$, where the curve meets the x-axis.	7
		Module-2	
Q. 03	a	Expand $\log(1 + sinx)$up to the term containing x^4 using Maclaurin's series.	6
	b	If $u = \log(tanx + tany + tanz)$ show that $sin2x\frac{\partial u}{\partial x} + sin2y\frac{\partial u}{\partial y} + sin2z\frac{\partial u}{\partial z} = 2$.	7
	c	Find the extreme values of the function $f(x, y) = x^2 + y^2 + 6x - 12.$	7
		OR	
Q. 04	a	Evaluate $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x}{3}\right)^{1/x}$	6
	b	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$	7
	c	If $x = rsin\theta cos\varphi,\ y = rsin\theta sin\varphi,\ z = rcos\theta$ find the value of $\frac{\partial(x,y,z)}{\partial(r,\theta,\varphi)}$.	7
		Module-3	
Q. 05	a	Solve $\frac{dy}{dx} + \frac{y}{x} = y^2x$	6
	b	Find the orthogonal trajectories of $r = a(1 + cos\theta)$ where a is parameter.	7
	c	Solve $p^2 + 2pycotx - y^2 = 0.$	7
		OR	

Q. 06	a	Solve $y(2xy+1)dx - xdy = 0$	6
	b	Find the orthogonal trajectories of the family $r^n sinn\theta = a^n$.	7
	c	Find the general solution of the equation $(px-y)(py+x) = 2p$ by reducing into Clairaut's form by taking the substitution $X = x^2,\ Y = y^2$	7
		Module-4	
Q. 07	a	(i) Find the remainder when 2^{23} is divided by 47. (ii) Find the last digit in 7^{118}.	6
	b	Find the solutions of the linear congruence $11x \equiv 4 \pmod{25}$.	7
	c	Encrypt the message **STOP** using RSA with key (2537, 13) using the prime numbers 43 and 59.	7
		OR	
Q. 08	a	Using Fermat's Little Theorem, show that $8^{30} - 1$ is divisible by 31.	6
	b	Solve the system of linear congruence $x \equiv 3(mod5),\quad y \equiv 2(mod6),\quad z \equiv 4(mod7)$ using Remainder Theorem.	7
	c	(i) Find the remainder when 175 × 113 × 53 is divided by 11. (ii) Solve $x^3 + 5x + 1 \equiv 0(mod27)$.	7
		Module-5	
Q. 09	a	Find the rank of the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$	6
	b	Solve the system of equations by using Gauss-Jordan method: $x+y+z=9$ $2x+y-z=0$ $2x+5y+7z=52$	7
	c	Using power method, find the largest eigenvalue and corresponding eigenvector of the matrix A = $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$	7
		OR	
Q. 10	a	Solve the following system of equation by Gauss-Seidel method: $20x+y-2z=17$ $3x+20y-z=-18$ $2x-3y+20z=25$	6
	b	Test for consistency $x-2y+3z=2$, $3x-y+4z=4$, $2x+y-2z=5$ and hence solve	7
	c	Solve the system of equations by Gauss elimination method $2x+y+4z=12,\ 4x+11y-z=33, 8x-3y+2z=20$	7

Table showing the Blooms Taxonomy Level, Course outcome and Program outcome				
Question		Blooms 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 03
Q. 4	a)	L2	CO 02	PO 01
	b)	L2	CO 02	PO 01
	c)	L3	CO 02	PO 02
Q. 5	a)	L2	CO 03	PO 02
	b)	L3	CO 03	PO 03
	c)	L2	CO 03	PO 01
Q. 6	a)	L2	CO 03	PO 02
	b)	L3	CO 03	PO 03
	c)	L2	CO 03	PO 01
Q. 7	a)	L2	CO 04	PO 01
	b)	L2	CO 04	PO 01
	c)	L2	CO 04	PO 02
Q. 8	a)	L2	CO 04	PO 01
	b)	L2	CO 04	PO 01
	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 02
	c)	L3	CO 05	PO 01

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