Model Question Paper- I with effect from 2022

CBCS SCHEME

First Semester B.E Degree Examination_____

Mathematics-I for Computer Science Engineering Stream (BMATS101)

TIME: 03Hours   **Max.Marks:100**

1. Note: *Answer any **FIVE** full questions, choosing at least **ONE** question from each MODULE*
2. *VTU Formula Hand Book is Permitted*
3. *M: Marks, L: Bloom's level, C: Course outcomes.*

		Module - 1	**M**	**L**	**C**
Q.1	**a**	With usual notation prove that $\tan\phi = r\dfrac{d\theta}{dr}$.	6	L2	CO1
	b	Find the anglebetweenthe curves $r = a\log\theta,\ r = \dfrac{\theta}{\log\theta}$	7	L2	CO1
	c	Show that the radius of curvature at any point of the cycloid $x = a(\theta + \sin\theta),\ y = a(1 - \cos\theta)\ is\ 4a\cos\left(\dfrac{\theta}{2}\right)$.	7	L3	CO1
		OR			
Q.2	**a**	Show that the curves $r = a(1 + \sin\theta)\ and\ r = a(1 + \sin\theta)$cut each other orthogonally.	7	L2	CO1
	b	Find the pedal equation of the curve $\dfrac{2a}{r} = (1 + \cos\theta)$.	8	L2	CO1
	c	Using modern mathematical tool write a program/code to plot the curve $r = 2|cos2\theta|$.	5	L3	CO5
		Module – 2			
Q.3	**a**	Expand $\log(\sec x)$ byMaclaurin'sseries up to thetermcontaining x^4.	6	L2	CO1
	b	If $u = e^{(ax+by)}f(ax - by)$, prove that $b\dfrac{\partial u}{\partial x} + a\dfrac{\partial u}{\partial y} = 2abu$ by using concepts composite functions.	7	L2	CO1
	c	Find the extreme values of the function $f(x,y) = x^3 + 3xy^2 - 3y^2 - 3x^2 + 4$.	7	L3	CO1
		OR			
Q.4	**a**	Evaluate (i) $\lim\limits_{x\to 0}\left(\dfrac{a^x+b^x}{2}\right)^{\frac{1}{x}}$. (ii) $\lim\limits_{x\to 0}\left(\dfrac{tanx}{x}\right)^{1/x}$.	7	L2	CO1

	b	If $x + y + z = u$, $y + z = uv$, $z = uvw$ find $\dfrac{\partial(x, y, z)}{\partial(u, v, w)}$.	8	L2	CO1
	c	Using modern mathematical tool write a program/code to show that $u_{xx} + u_{yy} = 0$ given $u = e^x(x\cos(y) - y\sin(y))$.	5	L3	CO5

Module – 3

Q.5	a	Solve: $\dfrac{dy}{dx} + \dfrac{y}{x} = x^2 y^6$.	6	L2	CO2
	b	Find the orthogonal trajectories of $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2 + \lambda} = 1$, where λ is a parameter.	7	L3	CO2
	c	Solve $xyp^2 - (x^2 + y^2)y + xy = 0$.	7	L2	CO2

OR

Q.6	a	Solve $(x^2 + y^2 + x)\,dx + xy\,dy = 0$	6	L2	CO2
	b	When a switch is closed in a circuit containing a battery E, a resistance R and an inductance L, the current i build up at a rate given by $L\dfrac{di}{dt} + Ri = E$. Find i as a function of t. How long will it be, before the current has reached one-half its final value, if E=6 volts, R=100 Ohms and L=0.1 Henry?	7	L3	CO2
	c	Find the general solution of the equation $(px - y)(py + x) = a^2 p$ by reducing into Clairaut's form by taking the substitution $X = x^2$, $Y = y^2$.	7	L2	CO2

Module – 4

Q.7	a	Find the least positive values of x such that $(i)\ 71 \equiv x(mod\ 8)\ (ii)\ 78 + x \equiv 3\ (mod\ 5)\ (iii)\ 89 \equiv (x + 3)(mod\ 4)$	6	L2	CO3
	b	Find the remainder when $(349 \times 74 \times 36)$ is divided by 3.	7	L2	CO3
	c	Solve: $2x + 6y \equiv 1(mod\ 7)$ and $4x + 2y \equiv 2(mod\ 7)$.	7	L3	CO3

OR

Q.8	a	(i) Find the last digit of 7^{2013} (ii) Find the last digit of 13^{37}.	6	L2	CO3
	b	Find the remainder when the number 2^{1000} is divided by 13.	7	L3	CO3
	c	Find the remainder when $14!$ is divided by 17.	7	L2	CO3

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		Module – 5			
Q.9	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	L2	CO4
	b	Solve the system of equations by Gauss-Jordan method $x + y + z = 10,\ 2x - y + 3z = 19,\ x + 2y + 3z = 22$.	7	L3	CO4
	c	For what values λ and μ the system of equations $2x + 3y + 5z = 9,\ 7x + 3y - 2z = 8,\ 2x + 3y + \lambda z = \mu,$ has (i) no solution (ii) a unique solution and (iii) infinite number of solutions.	7	L2	CO4
		OR			
Q.10	a	Solve the following system of equations by Gauss – Seidel method $10x + y + z = 12,\ x + 10y + z = 12,\ x + y + 10z = 12$.	8	L3	CO4
	b	Solve the following system of equations by Gauss-Elimination method $x + y + z = 9,\ x - 2y + 3z = 8,\ 2x + y - z = 3$.	7	L3	CO4
	c	Using modern mathematical tool write a program/code to find the largest eigen value of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ by power method.	5	L3	CO5