DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER II [CE, EC, IT]
SUBJECT: (BS201) MATHEMATICS-II

Examination	: Regular	Seat No	: 31
Date	: 19/6/2023	Day	: Monday
Time	: 10:00 to 1:00pm	Max. Marks	: 60

INSTRUCTIONS:
1. Answer each section in separate answer book.
2. Figures to the right indicate maximum marks for that question.
3. The symbols used carry their usual meanings.
4. Assume suitable data, if required & mention them clearly.
5. Draw neat sketches wherever necessary.

SECTION – I

Q.1 Do as directed. [10]

CO1 A (a) Solve: $(x^2-4xy-2y^2)dx+(y^2-4xy-2x^2)dy=0$. [2]

CO1 A (b) Solve: $(x^2-a^2)p^2-2xyp+y^2-b^2=0$ [2]

CO2 A (c) Evaluate: $\int_0^1\int_0^1\left(\frac{y}{\sqrt{1-x^2-y^2+x^2y^2}}\right)dx\,dy$. [2]

CO2 A (d) Change the order of integration only $\int_0^1\int_{y^2}^{2y} f(x,y)\,dx\,dy$. [2]

CO3 A (e) Find the whole area of the circle $r=2a\sin\theta$. [2]

Q.2 Attempt *Any TWO* from the following questions. [10]

CO3 A (a) Change to polar coordinates and hence evaluate the integral $\int_0^a\int_0^{\sqrt{a^2-x^2}}\left(y^2\sqrt{x^2+y^2}\right)dy\,dx$. [5]

CO3 A (b) Using *Green's* theorem evaluate $\oint_C (xy-x^2)\,dx+x^2y\,dy$, along the closed curve C formed by $y=0,\ x=1,$ and $y=x$. [5]

CO3 A (c) Evaluate surface integral $\iint \vec{F}\cdot\hat{n}\,ds$, for $\vec{F}=(x^2-yz)\vec{i}+(y^2-zx)\vec{j}+(z^2-xy)\vec{k}$ taken over the rectangular parallelopiped $0\le x\le a,\ 0\le y\le b,$ and $0\le z\le c$. [5]

Q.3 [10]

CO1 A (a) Solve: $\frac{dy}{dx}+x\sin 2y=x^3\cos^2 y$. [5]

CO2 A (b) Change the order of integration and then evaluate $\int_0^a\int_y^a\left(\frac{x}{x^2+y^2}\right)dx\,dy$. [5]

OR

Q.3 [10]

CO1 A (a) Solve the given equation: $y=2px+y^2p^3$; solvable for x. [5]

CO2 A (b) Evaluate $\iint_R xy\,dx\,dy$, over the region R in the positive quadrant for which $x+y\le 1$. [5]

SECTION – II

Q.4 Do as directed. [10]

CO4 A (a) Solve: $(D^2+4D-12)y=0$. [2]

CO4 A (b) Find the particular integral of the linear differential equation: $(D^2+9)y=\cos 3x$. [2]

CO5	A	(c)	Use *Newton-Raphson's* method to find a real root of $x^3 - 3x - 5 = 0$, correct up to three decimal places and taking $x_0 = 3$.	[2]
CO5	A	(d)	Using *Simpson's 1/3 rule* to evaluate $\int_0^1 \frac{dx}{1+x^2}$, taking $h = \frac{1}{6}$.	[2]
CO6	A	(e)	Find $L^{-1}\left[\frac{1}{\sqrt{7S+6}}\right]$.	[2]

Q.5 **Attempt *Any TWO* from the following questions.** **[10]**

CO6	A	(a)	Find $L\left[\frac{1-\cos t}{t^2}\right]$.	[5]
CO6	A	(b)	If $L(t \sin \omega t) = \frac{2\omega s}{(s^2+\omega^2)^2}$, using transform of derivative find (i) $L(\sin \omega t + \omega t \cos \omega t)$, and (ii) $L(2\,\omega \cos \omega t - \omega^2 t \ \sin \omega t)$	[5]
CO6	A	(c)	Find $L^{-1}\left[\frac{s+2}{s^2-4s+13}\right]$.	[5]

Q.6 **[10]**

CO4	A	(a)	Solve: $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^5$.	[5]
CO5	A	(b)	Find $L^{-1}\left[\frac{1}{s^2\,(s+1)^2}\right]$. using convolution theorem.	[5]

OR

Q.6 **[10]**

CO4	A	(a)	Solve: $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$, using variation of parameters method.	[5]
CO5	A	(b)	Solve the differential equation using *Laplace* transform. $\frac{d^2y}{dt^2} + y = \sin 3t$, satisfying the initial conditions $y(0) = y'(0) = 0$.	[5]

Blooms Taxonomy levels : R-Remembering, U- Understanding, A-Applying, N-Analyzing, E- Evaluating, C-Creating