



DHARMSINH DESAI UNIVERSITY, NADIAD  
FACULTY OF TECHNOLOGY  
SECOND SESSIONAL  
SUBJECT: (BS 201) MATHEMATICS-II

Examination	: B.Tech. Semester -II [CE, EC, IT]	Seat No.	: 91
Date	: 24/04/2023	Day	: MONDAY
Time	: 08:30 am to 09:45 am	Max. Marks	: 36

**INSTRUCTIONS:**

1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

- Q.1 Do as directed.** [12]
- CO3 A (a)** If  $\vec{F} = 3xy\vec{i} - y^2\vec{j}$ , evaluate  $\int_C \vec{F} \cdot d\vec{r}$  where C is the arc of the parabola  $y = 2x^2$  from (0,0) to (1,2). [2]
- CO3 A (b)** Evaluate  $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$ . [2]
- CO3 A (c)** Change to polar coordinates and evaluate  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$ . [2]
- CO4 A (d)** Employ *Taylor's series method* to obtain approximate value of  $y$  at  $x = 0.2$  for  $\frac{dy}{dx} = 2y + 3e^x$ ,  $y(0) = 0$ . [2]
- CO4 A (e)** Solve:  $\frac{d^2x}{dt^2} + 4x = 0$ . [2]
- CO4 A (f)** Find particular integral of  $(D^2 - 9)y = \cos 2x + 7$ . [2]
- Q.2 Attempt Any TWO from the following questions.** [12]
- CO3 A (a)** Show that  $\vec{F} = (2xy + z^3)\vec{i} + x^2\vec{j} + 3xz^2\vec{k}$  is a conservative field and find the scalar potential  $\phi$ . Also find the work done by moving a particle in this field from (1, -2, 1) to (3, 1, 4). [6]
- CO3 A (b)** Verify *Green's theorem* in a plane for  $\oint_C [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$  where C is the boundary of the region defined by  $y = \sqrt{x}$  and  $y = x^2$ . [6]
- CO3 A (c)** Find the area inside the cardioid  $r = a(1 + \cos \theta)$  and outside the circle  $r = 2a \cos \theta$ . [6]
- Q.3 Attempt Any ONE from the following questions.** [12]
- CO4 A (a)** Solve:  $(D^2 + 3D + 2)y = e^{e^x}$ . [6]
- CO4 A (b)** Given that  $\frac{dy}{dx} = 2 + \sqrt{xy}$  and  $y(1) = 1$ . Find an approximate value of  $y$  at  $x = 2$  in steps of 0.2 using modified *Euler's method*. [6]
- OR
- CO4 A (a)** Solve:  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 (\log x)^2$ . [6]
- CO4 A (b)** Solve:  $\frac{d^2y}{dx^2} + 4y = \tan 2x$ , using variation of parameters method. [6]

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