[Total No. of Question -05] Seat No: [ ] [Total No. of Pages: 02]

G. H. Raisoni College of Engineering and Management, Pune.
(An Autonomous Institution affiliated to Savitribai Phule Pune University)
F.Y B. Tech (All Branches) (Term II)
ESE Summer-2024 (2020 Pattern)
Integral Calculus and Differential Equations (UBSL104)

[Time: 2 Hours] [Max. Marks-50]

Instructions to the candidates:
1) All questions compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right indicate full marks.
4) Assume suitable data, if necessary.

Sub Question		*Marks*	*BL*	*CO*
Q 1. a)	Apply the DUIS method to evaluate the integral $\int_0^\infty \frac{e^{-x}}{x}(1-e^{-ax})dx, \quad (a>-1)$	[5]	L3	CO1
b)	Show that $\int_0^{\pi/2}\sqrt{tan\theta}\,d\theta.\int_0^{\pi/2}\sqrt{cot\theta}\,d\theta.=\frac{\pi^2}{2}$	[5]	L3	CO1
Q 2. a)	*Evaluate:* $\int_0^1\int_{x^2}^{x} xy(x+y)dxdy$	[5]	L4	CO2
	OR			
b)	Evaluate $\iint_R x^2y^2\ dxdy$ over the positive quadrant of the circle $x^2+y^2=1$	[5]	L4	CO2
c)	Evaluate $\int_1^3\int_2^3\int_1^2 (x-y+z)\ dxdydz$	[5]	L3	CO2
Q 3. a)	Evaluate $\oint_c [\cos y\ i + x(1-\sin y)j]\cdot d\bar{r}$ by using Green's theorem, where c is given by $x^2+y^2=1$, $z=0$.	[5]	L4	CO3

b) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot \hat{n}\, ds$ for $\bar{F} = (x^2 + y^2 - 4)i + 3xyj + (2xz + z^2)$ over the surface of the hemisphere $x^2 + y^2 + z^2 = 16$, above XOY plane. [5] L4 CO3

OR

c) Evaluate $\int \vec{F} \cdot d\vec{r}$ for $\vec{F} = 3x^2\hat{i} + (2xz - y)\hat{j} + z\hat{k}$ along the path given by the curves $x = 2t^2, y = t$ and $z = 4t^2 - t$ from $t = 0$ to $t = 1$. [5] L4 CO3

Q 4.a) Solve [5] L4 CO4

$$\frac{dy}{dx} + \frac{4x}{1+x^2}y = \frac{1}{(1+x^2)^3}$$

b) Solve $(D^2 + 2D + 1)\, y = 4sin\, 2x$ [5] L3 CO4

Q 5.a) Solve by method of variation of parameter [5] L4 CO4

$$\frac{d^2y}{dx^2} - 4y = e^{2x}$$

b) Solve: $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5$ [5] L4 CO4

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