K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-I Winter2024	
Exam Seat No.:	
Academic Year:2024-2025	Semester:III
Class:SY	Program:B.Tech
Branch Code:ELE/ETC	Pattern:2023
Name of Course:Advanced Calculus and Transform Techniques	Course Code:2300201E
Max. Marks:30	Duration:1:15 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 pages.
2. Answer to each new question is to be started on a new page.
3. Use of non-programmable scientific calculator is allowed.
4. Draw the neat labelled diagrams, wherever necessary.

		Marks	CO
Question No. 1			
1 a)	Find particular integral of $\frac{d^2y}{dx^2} + 4y = x\sin x$	(3)	CO2
1 b)	Find general solution of $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{-x}\cos 2x$	(4)	CO2
Question No. 2			
2 a)	Solve by using method of variation of parameter $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$	(4)	CO2
2 b)	Solve, $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \sin(\log x)$	(4)	CO2
	OR		
2 c)	Solve by using method of variation of parameter $\frac{d^2y}{dx^2} + y = \sec x$	(4)	CO2
2 d)	Solve, $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} - y = 2(1+x)$	(4)	CO2
Question No. 3			
3 a)	Find gradient of the function $\phi = \log(x^2 + y^2 + z^2)$ at the point (2,-2,1)	(3)	CO2
3 b)	Show that the vector field $\bar{f} = (2xz^3 + 6y)\bar{i} + (6x - 2yz)\bar{j} + (3x^2z^2 - y^2)\bar{k}$ is irrotational. Hence find the corresponding scalar potential ϕ such that $\bar{f} = \nabla\phi$.	(4)	CO4
Question No. 4			
4 a)	Find the directional derivative of $\phi = x^2yz + 4xz^2$ at the point P(1,-2,-1) in the direction of vector $2\bar{i} - \bar{j} - 2\bar{k}$.	(4)	CO2
4 b)	Evaluate the work done in moving a particle under the field of force given by, $\bar{f} = 3x\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ from (0,0,0) to (1,2,3).	(4)	CO4
	OR		
4 c)	Find the directional derivative of $\phi = xy + yz + xz$ at the point (1,2,0) in the direction of $\bar{a} = 2\bar{i} + \bar{j} + 3\bar{k}$.	(4)	CO2

4 d) Evaluate $\int_C \bar{f} \cdot d\bar{r}$ using Stoke's theorem where $\bar{f} = x^2\bar{i} + xy\bar{j}$ for the surface of rectangle bounded by x=0,y=0,x=1,y=2. (4) CO4

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