000228

PRN:		Course Code :	UEV301

Second Year **B. Tech** End Semester Examination Winter 2024

Differential Equations and Transforms

Day and Date: Fri 22 Nov 2024 Max Marks: **100**

Time : 10:30AM To 01:30PM Duration: **03** hrs

Instructions: 1) All questions are compulsory.
2) Use of non-programmable calculator is allowed.
3) Use of normal table is allowed

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	Solve $\frac{d^3y}{dx^3} - y = (e^x + 1)^2$	08	L3	CO1
b)	Solve $(D^4 + 10D^2 + 9)y = 96\sin 2x \cos x$	08	L3	CO1
	OR			
b)	Solve $(D^2 - 4D + 3)y = \left(x^2 e^x\right)^2$	08	L3	CO1
Q.2	**Attempt the following**			
a)	Find the Fourier series of function $f(x) = \begin{cases} -x & ; -\pi < x < 0 \\ 0 & ; 0 < x < \pi \end{cases}$	08	L4	CO2
b)	Find the Fourier series of function $f(x) = x$; on $[-1,1]$	08	L3	CO2
	OR			
b)	Find the half range sine series for $f(x) = \begin{cases} x & ; 0 < x < \pi/2 \\ \pi - x & ; \pi/2 < x < \pi \end{cases}$	08	L4	CO2
Q.3	**Attempt any two from the following**			
a)	Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$ and hence, evaluate $\int_0^\infty \tan^{-1}\left(\frac{x}{a}\right)\sin x dx$	08	L3	CO3
b)	Find the Fourier Transform of function $f(x) = e^{-\lvert x \rvert}$.	08	L3	CO3
c)	Find the Fourier Sine & Cosine Transform of function for $f(x) = \begin{cases} 1; & 0 \le x < 1 \\ 0; & x \ge 1 \end{cases}$	08	L3	CO3
Q.4	**Attempt any two from the following**			
a)	Find the directional derivative of $\phi = x^2y^2 + y^2z^2 + x^2z^2$ at $(1,1,-2)$ in the direction of $x = e^{-t}, y = 2\sin t + 1, z = t - \cos t$ at $t = 0$.	08	L2	CO3

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	b)	Find angle between the surfaces $xy = z^2$ at $(1,4,2)$ and $2x^2 + 3y + 3z^3 = 4$ at $(1,-1,2)$.	08	L2	CO3
	c)	Find the divergence and curl of the vector $\bar{f} = (y+z)i + (x+z)j + (x+y)k$ at the point $(1,0,2)$. Also prove that the vector $\bar{r} = 2xyz^3 i + x^2 z^3 j + 3x^2 yz^2 k$ is irrotational.	08	L2	CO3
Q.5		**Attempt any Two of the following**			
	a)	Find the real positive root of the equation $x^3 - 4x - 9 = 0$ using Bisection method correct to three decimal places up to 7^{th} approximations.	09	L3	CO4
	b)	Use the method of false position to find the fourth root of 32 correct up to three decimals.	09	L3	CO4
	c)	Solve using Gauss Elimination Method $x+3y-2z=5,\ 2x+y-3z=1,\ 3x+2y-z=6$	09	L3	CO4
Q.6		**Attempt any Two of the following**			
	a)	The probability mass function of a random variable X is x 0 1 2 3 4 5 6 7 $p(x)$ 0 c $2c$ $2c$ $3c$ c^2 $2c^2$ $7c^2+c$ Find *i)* c *ii)* $p(x \geq 6)$ *iii)* $p(x<6)$ *iv)* $p(1.5<x<4.5)$	09	L3	CO4
	b)	Six fair coins are tossed simultaneously, if 192 such tosses are made. Find the expected number of tosses showing i) one and only one head ii) no heads iii) all heads.	09	L3	CO4
	c)	Weights of 4000 students are found to be normally distributed with mean 50 and standard deviation 5. Estimate the number of students whose weight i) between 45 & 60 kgs. ii) less than 45kgs. iii) more than 60kgs.	09	L3	CO4

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