

11A TE 81/3

SET- A

Name:	Printed Pages:
Student University Roll No.:	
School of Engineering	
First Sessional Examination, Even Semester (AS: 2023-24)	
B. Tech: All	Year: First Semester: II
Course Title: Differential Equations and Fourier Analysis	Max Marks: 30
Course Code: NBS4201	Time: 1 hr

Instructions if any: Read the questions Carefully.

SECTION 'A'			Marks
Q.N.1. Attempt all parts of the following:			
a)	Find the order & degree of differential equation $\left(\frac{d^2y}{dx^2}\right)^2 - \left(\frac{dy}{dx}\right)^3 - 1 = 0$	CO1	1
b)	Find the complete solution of $\frac{d^4y}{dx^4} - y = 0$	CO1	1
c)	Find the particular integral of $(D^2 + 6D + 9)y = 5e^{3x}$	CO1	1
d)	Write the part of complementary function of $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ if it satisfies $1 + P + Q = 0$ .	CO1	1
e)	Reduce the equation $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 0$ into linear differential equation with constant coefficients.	CO1	1
SECTION 'B'			Marks
Q.N.2. Attempt any two parts of the following:			
a)	Solve the following differential equation $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 6y = \sin 3x$	CO1	7.5
b)	Solve the following simultaneous differential equations $Dx + Dy + 3x = \sin t$ $Dx + y - x = \cos t$	CO1	7.5
c)	Solve $x^2 \frac{d^2y}{dx^2} - (2x-1)\frac{dy}{dx} + (x-1)y = 0$ , given that $y = e^x$ is an integral included in the complementary function.	CO1	7.5

d)	Solve the homogeneous differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 2x^2$	CO1	7.5
SECTION 'C'			Marks
Q.N.3. Attempt any one part of the following:			
a)	Solve $x \frac{d^2y}{dx^2} + (4x^2 - 1)\frac{dy}{dx} + 4x^3y = 2x^3$ , by changing the independent variable.	CO1	10
b)	Use variation of parameters method to solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$	CO1	10
c)	Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 2xe^{3x}$	CO1	10

Table 1: Mapping between COs and questions

(Number of COs may vary from course to course)

COs	Questions Numbers	Total Marks
CO1	ALL	65

SET-B

Name:	Printed Pages:
Student University Roll No.:	
School of Engineering	
First Sessional Examination, Even Semester (AS: 2023-24)	
B. Tech: All	Year: First Semester: II
Course Title: Differential Equations and Fourier Analysis	Max Marks: 30
Course Code: NBS4201	Time: 1 hr

Instructions if any: Read the questions Carefully.

SECTION 'A'		Marks
Q.N.1. Attempt all parts of the following:		
a) Find the order & degree of differential equation $1 + \left(\frac{dy}{dx}\right)^2 = \left(\frac{d^2y}{dx^2}\right)^2$	CO1	1
b) Find the particular integral of $(D^2 - 1)y = \log 5$	CO1	1
c) Find the complete solution of $\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} = 0$	CO1	1
d) Write the part of complementary function of $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ if it satisfies $P + Qx = 0$	CO1	1
e) Reduce the Legendre homogeneous differential equation $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2) \frac{dy}{dx} - 36y = 0$ into linear differential equation with constant coefficients.	CO1	1
SECTION 'B'		Marks
Q.N.2. Attempt any two parts of the following:		
a) Solve the following differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \sin 2x$	CO1	7.5
b) Solve the following simultaneous differential equations $Dx + 5x' - 2y = t$ $Dy + 2x + y = 0$	CO1	7.5
c) Solve $\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + (4x^2 - 2)y = 0$ , given that $y = e^{x^2}$ is an	CO1	7.5

integral included in the complementary function.		
Solve the homogeneous differential equation $(3x+2)^2 \frac{d^2y}{dx^2} - (3x+2) \frac{dy}{dx} - 12y = 6x$		
SECTION 'C'		Marks
Q.N.3. Attempt any one part of the following:		
a) Solve $\frac{d^2y}{dx^2} - \frac{1}{x} \frac{dy}{dx} + 4x^2y = x^4$ , by changing the independent variable.	CO1	210
b) Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2} + y = \sec x$	CO1	10
c) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x}$	CO1	10

Table 1: Mapping between COs and questions

(Number of COs may vary from course to course)

COs	Questions Numbers	Total Marks
CO1	ALL	65

$$y = e^{x^2} (C_1 x + C_2)$$