KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY
DEEMED TO BE UNIVERSITY, BHUBANESWAR – 24
(Decld. U/S 3 of UGC Act, 1956)
OFFICE OF THE CONTROLLER OF EXAMINATIONS

KIIT Deemed to be University
Online Mid Semester Examination(Autumn Semester-2021)

Subject Name & Code: MATH-I & MA 1003
Applicable to Courses: B. Tech. (All Branches)

Full Marks=20 **Time:1 Hour**

SECTION-A(Answer All Questions. All questions carry 2 Marks)
Time:20 Minutes **(5×2=10 Marks)**

Question No	Question Type(MCQ)	Question	CO Mapping
Q.No:1(a)	MCQ	The solution of the ODE $y' = 2e^{-x}\cos x$ is a. $y = 2e^{-x}(\sin x - \cos x) + c$ b. $y = e^{-x}(\sin x + \cos x) + c$ c. $y = 2e^{-x}(\sin x + \cos x) + c$ d. $y = e^{-x}(\sin x - \cos x) + c$	CO1 Ans. (d)
	MCQ	The solution of the ODE $y' = 2e^{-x}\sin x$ is a. $y = 2e^{-x}(\sin x - \cos x) + c$ b. $y = e^{-x}(\sin x + \cos x) + c$ c. $y = -e^{-x}(\sin x + \cos x) + c$ d. $y = -2e^{-x}(\sin x + \cos x) + c$	CO1 Ans. (c)
	MCQ	The equation of the curve, for which the angel between the tangent and the radius vector is twice the vectorial angle is $r^2 = a\sin 2\theta$. This satisfies the differential equation a. $r\frac{dr}{d\theta} = \tan 2\theta$ b. $r\frac{d\theta}{dr} = \tan 2\theta$ c. $r\frac{dr}{d\theta} = \cos 2\theta$ d. $r\frac{d\theta}{dr} = \cos 2\theta$	CO1 Ans. (b)
	MCQ	The differential equation satisfying the relation $x = A\cos(mt - \alpha)$ is a. $\frac{d^2x}{dt^2} = -m^2x$ b. $\frac{dx}{dt} = 1 - x^2$ c. $\frac{dx}{dt} = -m^2x$	CO1 Ans. (a)

		d. $\frac{d^2x}{dt^2} = -\alpha^2 x$	
Q.No:1(b)	**MCQ**	An integrating factor of $(e^{x+y} - y)dx + (xe^{x+y} + 1)dy = 0$ is a. e^x b. e^{-x} c. $-e^x$ d. x^2	CO1 **Ans. (b)**
	MCQ	An integrating factor of the differential equation $y' \tan x = 2y - 8$ is a. $\cos ec^2 x$ b. $\sin^2 x$ c. $\cos^2 x$ d. $-\cos ec^2 x$	CO1 **Ans. (a)**
	MCQ	An integrating factor of $(x^4 + y^2)\,dx - xy\,dy = 0$ is a. x^3 b. e^{x^3} c. x^{-3} d. e^{-3x}	CO1 **Ans. (c)**
	MCQ	An integrating factor of the differential equation $y' \cot x - 2y = 1$ is a. $\cos ec^2 x$ b. $\sin^2 x$ c. $\sec^2 x$ d. $\cos^2 x$	CO1 **Ans. (d)**
Q.No:1(c)	**MCQ**	The form of the ODE $xy' - 2e^x y = 2xy$ is a. Linear and homogeneous b. Linear and non-homogeneous c. Non-linear and non-homogeneous d. Non-linear and homogeneous	CO1 **Ans. (a)**
	MCQ	A differential equation of the form $y' + p(x)y = q(x)$,where $p(x)$ and $q(x)$ are nonzero functions of x, is always a. Linear and homogeneous b. Linear and non-exact c. Nonlinear and exact d. Linear and exact	CO1 **Ans. (b)**
	MCQ	How many integrating factors does a non-exact differential equation have? a. One b. Infinite c. Zero d. None of these	CO1 **Ans. (b)**
	MCQ	The linearity principle of the differential equation is applicable to which of the following ODE? a. $\frac{d^2y}{dx^2} + y\left(\frac{dy}{dx}\right) = 0$	CO1 **Ans. (c)**

		b. $\frac{d^2y}{dx^2}+xy=\cos x$ c. $\frac{d^2x}{dy^2}+y\left(\frac{dx}{dy}\right)+e^y x=0$ d. $\frac{d^2y}{dx^2}+\frac{dy}{dx}+y+1=0$	
Q.No:1(d)	**MCQ**	The homogeneous linear ODE for the given basis of solutions $e^{\sqrt{3}x}$ and $xe^{\sqrt{3}x}$ is a. $y''-2\sqrt{3}y'+3y=0$ b. $y''+2\sqrt{3}y'+3y=0$ c. $y''+2\sqrt{3}y'-3y=0$ d. $y''-2\sqrt{3}y'+\sqrt{3}y=0$	CO2 **Ans. (a)**
	MCQ	The homogeneous linear ODE for the given basis of solutions 1 and $\ln x$ is a. $y''=0$ b. $y''+y'=0$ c. $xy''+y'=0$ d. $x^2y''=0$	CO2 **Ans. (c)**
	MCQ	The homogeneous linear ODE for the given basis of solutions $\cosh\frac{x}{2}$ and $\sinh\frac{x}{2}$ is a. $4y''+y'=0$ b. $4y''-y=0$ c. $4y''-y'=0$ d. $4y''+y=0$	CO2 **Ans. (b)**
	MCQ	If the roots of Characteristic equation is $-1\pm i$ then the Euler-Cauchy equation is a. $x^2y''+2xy'+2y=0$ b. $x^2y''+2xy'+y=0$ c. $x^2y''-2xy'-2y=0$ d. $x^2y''+3xy'+2y=0$	CO2 **Ans. (d)**
Q.No:1(e)	**MCQ**	The solution of $yy''=2(y')^2$ is a. $y=Ax+B$ b. $y=Ax^{-1}+B$ c. $y=(Ax+B)^{-2}$ d. $y=(Ax+B)^{-1}$	CO2 **Ans. (d)**
	MCQ	The solution of $yy''=(y')^2$ is a. $y=Ae^{Bx}$ b. $y=Ae^{2Bx}$ c. $y=Ae^{-2Bx}$ d. $y=Ax+B$	CO2 **Ans. (a)**
	MCQ	The solution of $y''=(y')^3$ is	CO2 **Ans. (b)**

		a. $x = Ay + B + \frac{y^2}{2}$ b. $x = Ay + B - \frac{y^2}{2}$ c. $x = y^2 + Ay + B$ d. $x = -y^2 + Ay + B$	
	MCQ	The solution of $y'' = 2(y')^3$ is a. $x = Ay + B + \frac{y^2}{2}$ b. $x = y^2 + Ay + B$ c. $x = -y^2 + Ay + B$ d. $x = Ay + B - \frac{y^2}{2}$	CO2 **Ans. (c)**

SECTION-B(Answer Any One Question. Each Question carries 10 Marks)

Time: 30 Minutes **(1×10=10 Marks)**

Question No. (Question Bank)	Question	CO Mapping
Question No:2	(a) Solve the Initial Value Problem: $xy' = y + 2x^3 \tan\left(\frac{y}{x}\right),\ y(1) = \frac{\pi}{2}$ (b)Reduce to first order and solve the ODE $(1-x^2)y'' - 2xy' + 2y = 0, \quad y_1 = x$	CO1 & CO2
Question No:3	(a) Test for exactness and solve the given ODE $2x \tan y\, dx + \sec^2 y\, dy = 0.$ (b) Solve the Initial Value Problem: $(xD^2 + 4D)y = 0, \quad y(1) = 12, \quad y'(1) = -6.$	CO1 & CO2
Question No:4	(a) Reduce to linear form then find a general solution. $2yy' + y^2 \sin x = \sin x$ (b) Solve the Initial Value Problem: $y'' - 2y' - 24y = 0, \quad y(0) = 0, \quad y'(0) = 20.$	CO1 & CO2
Question No:5	(a). Find the approximate solution to the Initial Value Problem using Picard's method: $y' = xy + 1,\ y(0) = 1$ in three Iterations. (b) A body originally at $80\ ^0C$ cools down to $60\ ^0C$ in 20 minutes, the temperature of the air being $40\ ^0C$. What will be the temperature of the body after 40 minutes from the original?	CO1 & CO2
Question No:6	(a) If an airplane has run of 2 km. starts with a speed 6 m/sec, moves with constant acceleration, and makes the run in 1 min. with what speed does it take off? (b). Find the general solution. $x^3y' + 3x^2y = 5\sinh 10x$	CO1 & CO2

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