

10. Outline & transform the equation 2 K2 CO5

$(2x+3)^2 \frac{d^2y}{dx^2} - 2(2x+3) \frac{dy}{dx} - 12y = 6x$ into a differential equation with constant coefficients.

PART – B

(5 x 16 = 80 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	i. Find the absolute maximum and minimum values of $f(x) = x^3 - 3x^2 + 1, -\frac{1}{2} \leq x \leq 4$.	8	K3	CO1
	ii. Explain why the function is discontinuous $f(x) = \begin{cases} \cos x, & \text{if } x < 0 \\ 0, & \text{if } x = 0, a = 0 \\ 1 - x^2, & \text{if } x > 0 \end{cases}$	8	K2	CO1
(OR)				
b)	i. Make use of mean value theorem to verify for the function $f(x) = \sin x$ in $(\frac{\pi}{2}, \frac{5\pi}{2})$.	8	K3	CO1
	ii. If $f(1) = 10$ & $f'(x) \geq 2$ for $1 \leq x \leq 4$, interpret how small can $f(4)$ possibly be ?	8	K2	CO1
12. a)	i. Construct $f(x,y) = x^3 + y^3 - 12x - 3y + 20$ for its extreme values.	8	K3	CO2
	ii. If $g(x,y) = \psi(u,v)$ where $u = x^2 - y^2, v = 2xy$, then show that $\frac{\partial^2 g}{\partial x^2} + \frac{\partial^2 g}{\partial y^2} = 4(x^2 + y^2) \left[\frac{\partial^2 \psi}{\partial u^2} + \frac{\partial^2 \psi}{\partial v^2} \right]$.	8	K2	CO2
(OR)				
b)	i. Make use of Taylor's series to expand $e^x \cos y$ about $(0, \frac{\pi}{2})$ up to the third term .	8	K2	CO2
	ii. If $u = \frac{yz}{x}, v = \frac{zx}{y}, w = \frac{xy}{z}$, show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$.	8	K3	CO2
13. a)	i. Evaluate the integral $I = \int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$.	8	K5	CO3
	ii. Evaluate the integral $I = \int \frac{\sec^2 x}{\tan^2 x + 3 \tan x + 2} dx$.	8	K5	CO3
(OR)				
b)	i. Evaluate the integral $I = \int \frac{x^2}{\sqrt{9-x^2}} dx$.	8	K5	CO3
	ii. Evaluate the integral $I = \int \sin 4x \cos 5x dx$.	8	K5	CO3

14. a) Change the order of integration and hence evaluate $\int_0^{4a} \int_{\frac{x^2}{a}}^{2a-x} xy dx dy$. 16 K5 CO4
- (OR)
- b) i. Determine the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 8 K5 CO4
- ii. Evaluate the integral $I = \int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{\sqrt{1-x^2-y^2-z^2}} dz dy dx$. 8 K5 CO4
15. a) i. Solve $(x^2 D^2 - xD + 4)y = x^2 \sin(\log x)$. 8 K3 CO5
- ii. Solve $(D^2 - 3D + 2)y = 2 \cos(2x + 3) + 2e^x$. 8 K3 CO5
- (OR)
- b) Solve $(D^2 + a^2)y = \tan ax$ by method of variation of parameters. 16 K3 CO5