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(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 20 22-2025 ONLY)

22UMS102

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS: DECEMBER- 2022

COURSE NAME: B.Sc.- MATHEMATICS (Aided) **MAXIMUM MARKS: 50**

SEMESTER: I **TIME : 3 HOURS**

PART – III

CALCULUS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. (K1)

1. The Auxiliary Equation is $m^2 + 2m + 1 = 0$then y =__________________.
   a) $e^{-x}(A + BX)$ b) $(A + BX)$ c) e^{-x} d) 0

2. If $x + y\frac{\partial z}{\partial x} = 0$then, z =_______
   a) x+2y b) $-\frac{x^2}{2y} + \phi(y)$ c) 0 d)3x-2

3. $\int_a^b f(x)dx =$____________
   a) F(b) – F(a) b) F(a) – F(b) c) F(b) + F(a) d)F(a) + F(b)

4. $\frac{\partial(u,v,w)}{\partial(x,y,z)} \frac{\partial(x,y,z)}{\partial(u,v,w)}$ =___________
   a) 0 b) 1 c) -1 d) 2

5. L(cos at) =________
   a)$\frac{s}{s^2+a^2}$ b) $\frac{s}{a^2}$ c) $\frac{s}{s^2-a^2}$ d) $\frac{s^2+a^2}{s}$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 4y = 0$.

7. Solve $\frac{\partial^2 z}{\partial y^2} = siny$.

8. Evaluate $\int_0^a\int_0^a xydxdy$

9. Find $\int_0^1 x^7(1-x)^8dx = \beta(8,9)$.

10. Find $L\ (\ t^2 + 2t + 3)$.

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Solve $(\ D^2 + 5D + 6\ )y =\ e^x$

(OR)

b) Solve $(\ D^2 - 3D + 2\ )y =\ sin3x$

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12. a) Solve $x\frac{\partial z}{\partial x} = 2x + y + 3z$.

(OR)

b) Solve $p = y^2q^2$.

13.a) Evaluate $\iint (x^2 + y^2)dxdy$ over the region for which $x \geq 0, y \geq 0$ and $x + y \leq 1$.

(OR)

b) Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

14. a) Given that *x+ y=u ,y=uv* change the variable to *u* , *v* in the integral $\iint [\text{xy}(1 - \text{x} - \text{y})]^{1/2}\text{dxdy}$ taken over the area of the triangle with sides *x=0* , *y=0* , *x +y=1* and evaluate it .

(OR)

b) Evaluate $\int_0^1 x^m (log\frac{1}{x})^n\, dx$.

15. a) Evaluate $\int_0^\infty \frac{e^{-t}-e^{-2t}}{t} dt$.

(OR)

b) Find $L^{-1}\left[\frac{s+2}{(s^2+4s+5)^2}\right]$.

SECTION – C (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) Prove that the radius of curvature at any point of the cycloid $x = a(\theta + sin\theta)$ and $y = a(1 - cos\theta) is\ 4acos\frac{\theta}{2}$.

(OR)

b) Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$

17. a) Find the general solution of $(y + z)p + (z + x)q = x + y$

(OR)

b) Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$ given that when x=0, $\frac{\partial z}{\partial x} = asiny$ and $\frac{\partial z}{\partial y} = 0$.

18. a) Evaluate $\iiint xyzdxdydz$ taken through the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$.

(OR)

b) By transforming into polar coordinates Evaluate $\iint \frac{x^2y^2}{x^2+y^2} dxdy$ over the annular region between the circles $x^2 + y^2 = a^2 and x^2 + y^2 = b^2 (b > a)$.

19.a) Express $\int_0^1 x^m(1 - x^n)^p dx$ interms of gamma functions and evaluate the integral $\int_0^1 x^5(1 - x^3)^{10} dx$.

(OR)

b) Evaluate $\iint_R (x - y)^4 e^{x+y} dxdy$ where R is the square with vertices (1, 0), (2, 1)(1,2) and (0,1).

20.a) Find $L^{-1}\left[\frac{1}{(s+1)(s^2+2s+2)^2}\right]$. ,

(OR)

b) Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = sint$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$.

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