

S.No.: 356 BATCH: 87 - 2018

Reg.No.:

END OF SEMESTER EXAMINATIONS, NOVEMBER - 2018
MATHEMATICS PAPER - II
SUBJECT CODE: 14UBMA02

MAJOR: B.Sc.,(PHYSICS)
TIME : 3 HOURS

SEMESTER : I
MAX.MARKS : 75

SECTION - A (5 X 2 = 10)

Answer ALL Questions:

1. Find the n^{th} derivative of e^{ax} .
(OR)
2. Find $\frac{du}{dt}$ if $u = x^3y^4$, where $x = t^3$ and $y = t^2$.
3. Evaluate $\int \sin^2 x \, dx$.
(OR)
4. Evaluate $\int x^2 e^x \, dx$.
5. Evaluate the double integral $\int_0^1 \int_0^{x^2} (x^2 + y^2) \, dy \, dx$.
(OR)
6. Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(\theta + \phi) \, d\theta \, d\phi$.
7. Define diagonally dominant matrix with an example.
(OR)
8. Write any two algebraic equation.
9. Write down Simson's $\frac{1}{3}$ rule.
(OR)
10. Compute the value of the definite integral $\int_4^{5.2} \log_e x \, dx$ (or) Find $\int_4^{5.2} I_n x \, dx$, using Trapezoidal rule.

SECTION - B (5 X 4 = 20)

Answer ALL Questions:

11. Find $D^n \left[\frac{1}{(x+1)(x+3)} \right]$.
(OR)
12. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$.
13. Evaluate $\int x^3 \cos x \, dx$.
(OR)
14. Evaluate $\int_0^{\pi/2} \sin^8 x \cos^6 x \, dx$.
15. Evaluate $\iint_R (x^2 + y^2) \, dx \, dy$, where R is the region in the positive quadrant for which $x + y \leq 1$.
(OR)
16. Evaluate $\int_0^a \int_0^{\sqrt{ax-x^2}} x^2 \, dy \, dx$.

17. Find the smallest positive root of the equation $x^3 - 2x + 0.5$, using Newton's Raphson method.

(OR)

18. Find the real root of the equation $f(x) = x^3 - x - 1 = 0$, using Bisection method.

19. Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Trapezoidal rule with $h = 0.2$. Hence determine the value of π .

(OR)

20. Using Taylor's Series, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$.

SECTION - C (5 X 9 = 45)

Answer ALL Questions:

21. If $y = a \cos(\log x) + b \sin(\log x)$, show that $x^2 y_2 + x y_1 + y = 0$ and $x^2 y_{n+2} + (2n+1) x y_{n+1} + (n^2+1) y_n = 0$.

(OR)

22. Find $\frac{du}{dx}$ if $u = \tan^{-1}\left(\frac{x}{y}\right)$ where $x^2 + y^2 = a^2$.

23. Evaluate $\int \sin^7 x dx$.

(OR)

24. Prove that (i) $\int_0^\pi \sin^6 x dx = 2 \int_0^{\pi/2} \sin^6 x dx$, (ii) Prove that $\int_0^\pi \cos^4 x dx = 2 \int_0^{\pi/2} \cos^4 x dx$

25. Evaluate $\int_0^{2\pi} \int_0^{\pi/4} \int_0^a r^2 \sin \theta dr d\theta d\phi$.

(OR)

26. Change the order of integration in $\int_0^a \int_x^a (x^2 + y^2) dy dx$ and hence evaluate it.

27. Solve the following system by Gaussian Elimination Method.

$$x_1 - x_2 + x_3 = 1$$

$$-3x_1 + 2x_2 - 3x_3 = -6$$

$$2x_1 - 5x_2 + 4x_3 = 5$$

(OR)

28. Solve the system of equations by Gauss-Seidal Iteration Method.

$$8x - y + z - 18 = 0$$

$$2x + 5y - 2z - 3 = 0$$

$$x + y - 3z + 6 = 0$$

29. Using improved Euler's Method find y at $x = 0.1$ and $x = 0.2$ given

$$\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1.$$

(OR)

30. Find $y(0.2)$, given $\frac{dy}{dx} = y - x$, by using second order Runge-Kutta Method, given $y(0) = 2$ by taking $h = 0.1$.

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