



Date: 15-05-2023

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Answer ALL questions

(10 x 2 = 20)

1. Evaluate $\int_0^1 \int_0^1 xy \, dx dy$.
2. Define Gamma function.
3. Solve $\sqrt{1-x^2} \, dy - \sqrt{1-y^2} \, dx = 0$.
4. Solve $\frac{d^2y}{dx^2} - 4y = 0$.
5. Define Laplace transform.
6. Find $L(e^t)$.
7. What is the formula for Newton Raphson's method?
8. Write the Newton's forward interpolation formula.
9. Give an example of an abelian group.
10. Define normal subgroup.

PART – B

Answer any FIVE questions

(5 x 8 = 40)

11. Evaluate $\iint xy \, dx dy$ taken over the positive quadrant of the circle $x^2 + y^2 = a^2$.
12. a). Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$
b). Evaluate $\int_0^1 x^7(1-x)^8 \, dx$.
13. Solve $(D^2 - 5D + 4)y = e^{-x}$.
14. Solve $(y^2 + z^2)p - xyq + xz = 0$.
15. Using Laplace transform, evaluate $\int_0^\infty e^{-2t} \sin 3t \, dt$.
16. Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$.
17. Using Newton-Raphson method, find root between 0 and 1 of $x^3 + 2x^2 + 10x = 20$ correct to four decimal places.
18. State and prove the cancellation laws in group theory.

PART – C

Answer any TWO questions

(2 x 20 = 40)

19. Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.

20. Solve $(D^2 + 4D + 5)y = e^x + x^2 + \sin 2x$.

21. By using Laplace transform solve the differential equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$, given that $y = \frac{dy}{dt} = 0$ when $t = 0$.

22. Solve the following system of equations using Gauss elimination method.

$$\begin{aligned}x - y + z &= 1 \\3x - 2y + 3z &= 6 \\2x - 5y + 4z &= 5\end{aligned}$$

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