LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION –CHEMISTRY

SECOND SEMESTER – APRIL 2018

17/16UMT2AL03– MATHEMATICS FOR CHEMISTRY - II

Date: 28-04-2018   Dept. No. [   ]   Max. : 100 Marks
Time: 01:00-04:00

Part A

Answer ALL Questions: (10 x 2 = 20)

1. Evaluate $\int_0^1 \int_0^a x \, dx \, dy$.

2. Show that $\Gamma(1) = 1$.

3. Solve $\frac{dy}{dx} + \left(\frac{1-y^2}{1-x^2}\right)^{1/2} = 0$.

4. Solve $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} + 2y = 0$.

5. Find the Laplace transform of $t^2 + 2t + 3$.

6. Find $L^{-1}\left(\frac{s}{s^2+k^2}\right)$.

7. Where does the root lie between for the polynomial $f(x) = x^3 + 2x^2 - 3x - 5$?

8. Write the formula for Newton's backward interpolation.

9. When does a group will become an abelian group?

10. Define subgroup with an example.

Part B

Answer any FIVE Questions: (5 x 8 = 40)

11. Evaluate $\iint (x^2 + y^2) \, dx \, dy$ over the region for which x, y are each ≥ 0 and $x + y \leq 1$.

12. Solve $(1 - x^2)\frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$.

13. Solve $(y^2 + z^2)p - xyq = -xz$.

14. Find $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$.

15. The following data give I, the indicated HP and V, the speed in knots developed by a ship.

V	8	10	12	14	16
I	1000	1900	3250	5400	8950

Find I when V = 9, using Newton's forward interpolation formula.

16. Using Newton Raphsonmethod find the root between 0 and 1 of $x^3 + 2x^2 + 10x - 20 = 0$ correct to four decimal places.

17. (i) Prove that the intersection of two subgroups of a group is also a subgroup of the group.

(ii) Give an example to show that union of two subgroups need not be a subgroup.

18. State and prove the Cancellation laws in groups.

Part C

Answer any TWO Questions: $\qquad$ **(2 x 20 = 40)**

19. (a) Evaluate $\iiint xyz \, dx \, dy \, dz$ over the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$ by transforming into spherical co-ordinates.

(b) Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. $\qquad$ **(10 + 10)**

20. (a) Solve$(D^2 + 4D + 5)y = e^x + x^3 + cos2x$.

(b) Solve$p^2 + q^2 - 2px - 2qy + 1 = 0$. $\qquad$ **(10 + 10)**

21. Using Laplace transform, solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4$ given that $y = 2$ and$\frac{dy}{dt} = 0$when$x = 0$.

$\qquad$ **(20)**

22. (a) Solve the system of equations, $x - y + z = 1, -3x + 2y - 3z = -6$ and $2x - 5y + 4z = 5$ by Gauss elimination method.

(b) Prove that the set of integers Z forms a group under usual addition. $\qquad$ **(12 + 8)**

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