B.M.S COLLEGE FOR WOMEN AUTONOMOUS
BENGALURU – 560004

END SEMESTER EXAMINATION – SEPTEMBER / OCTOBER 2022

B.Sc - II Semester
Algebra-II and Caculus-II

Course Code: MAT2DSC02 **QP Code:2015**
Duration: 2 ½ Hours **Max Marks: 60**

I. Answer any SIX Questions: **(2x6=12)**

1. Define index of a subgroup.

2. Find the order of the elements in the multiplicative group of $G = \{1, -1, i, -i\}$.

3. Find radius vector and the tangent to the curve $r = a\theta$

4. Find polar sub-tangent to the curve $r = a(1 + cos\theta)$ at $\theta = \frac{\pi}{3}$

5. Evaluate $\int_0^{\frac{\pi}{2}} \sin^6 x dx$

6. Evaluate $\int_0^{\frac{\pi}{2}} \sin^2 x cos^2 x \, dx$

7. Evaluate $\int_0^2 \int_0^1 xydxdy$

8. Evaluate $\int_0^1 \int_0^2 \int_0^3 (xyz) dxdydz$

II. Answer any TWO Questions: **(2x6=12)**

1. Show that the set $Q_{-\{1\}}$, the set of rational numbers other that -1 is an abelian group under the operation * defined by $a * b = a + b + ab, \forall a, b \in Q_{-\{1\}}$. Also solve $2 * 5 * x = 0$

2. Prove that if a is any element of a group G of order n then a^m=e for any integer m if and only if n divides m.

3. State and prove Lagrange's theorem.

III. Answer any SIX Questions: **(6x6=36)**

1. With usual notations, show that $\tan\varphi = r\frac{d\theta}{dr}$

2. Find the pedal equation of $r^2 = a^2 cos2\theta$

3.a) Find $\frac{dS}{dt}$ for the curve $x = a(t - sint)$ and $y = a(1 - cost)$

b) Find the radius of curvature for $y = 4sinx - sin2x$ at $x = \frac{\pi}{2}$

4. Derive reduction formula for $\int \sin^n x\, dx$ and hence evaluate $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$

5. Evaluate $\int_0^a \frac{x^4}{\sqrt{a^2-x^2}} dx$

6. Find the surface area of solid generated by revolving the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ about X-axis.

7. Evaluate $\int (x + 2y)dx + (4 - 2x)dy$ around the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ in the counter clockwise direction.

8. Evaluate $\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x + y + z)dydxdz$.

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