B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2018
SEMESTER – 2: MATHEMATICS (COMPLEMENTARY FOR PHYSICS & CHEMISTRY)
COURSE: **15U2CPMAT2– INTEGRAL CALCULUS AND MATRICES**
(Common for Regular 2017/Supplementary-improvement 2016/2015 /2014 Admissions)

Time: Three Hours   Max. Marks: 75

PART A
Answer all questions. Each question carries 1 mark.

1. State Pappus theorem for Volumes.
2. What is the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & 0 & 5 & 7 \end{bmatrix}$
3. Define the normal form of a matrix.
4. Find the eigen values of the matrix $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 8 \end{bmatrix}$
5. State Fubini's theorem in first form
6. Show that the eigen values of a diagonal matrix are the same as its diagonal elements.
7. Find the characteristic equation of the matrix $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$.
8. Find the average value of f(x)=(t-1)² on [0,3].
9. Define the rank of a matrix.
10. Evaluate $\frac{dy}{dx}$ if $y = \int_1^{x^2} Cos\, t\, dt$ (1 x 10 = 10)

PART B
Answer Any Eight. Each Question Carries 2 marks

11. Find the area enclosed by the cardioid $r = (1 + cos\theta)$.
12. Show that the value of $\int_0^{\pi/2} \sqrt{Sin\,x}\, dx$ is less than π/2.
13. Evaluate $\int_2^a \int_2^b \frac{1}{xy}\, dx\, dy$
14. By reducing to Echelon form, find the rank of $\begin{bmatrix} 1 & 6 & -18 \\ -4 & 0 & 5 \\ -3 & 6 & -13 \end{bmatrix}$
15. Change into polar co ordinates $\int_0^1 \int_0^{\sqrt{1-x^2}} (x^2 + y^2)\, dydx$
16. Find the area of the region enclosed by the parabola $y = x^2 – 2$ and the line $y = 2$.
17. Find the length of the curve y=log Secx between the points given by x=0 and x=π/3.
18. Find the area of the surface generated by revolving about the axis of x, the arc of the parabola $y^2 = 4ax$ from the origin to the point where x=a, a>0.
19. Find the area of the surface generated by revolving the curve
    $y = 2\sqrt{x}, 1 \le x \le 2, about\ the\ X-axis$
20. Find the average value of $f(x) = 4 – x^2$ on [0,3].   (2 x 8 = 16)

PART C

Answer Any Five.   Each Question Carries 5 marks

21. Find the area of the region between the curve $y = x^2 - 6x + 8$, $0 \le x \le 3$.

22. Find the area of the Cardioid $r = a(1 + \cos \theta)$

23. The circle $x^2 + y^2 = a^2$, is rotated about X-axis to generate a sphere. Find its Volume by disk method.

24.   Solve by Cramer's rule: 5x+3y+3z = 48:

            2x+6y-3z = 18:

            8x-3y+2z = 21.

25. State and prove the mean value theorem for definite integrals

26. Find all non trivial solution$s$ of $x_1 + 3x_2 + 2x_3 = 0$; $2x_1 - x_2 + 3x_3 = 0$; $3x_1 - 5x_2 + 4x_3 = 0$; $x_1 + 17x_2 + 4x_3 = 0$.

27. Evaluate $\int_0^1 \int_0^1 \int_0^{1-x2-y2} dz\, dy\, dx$ (5 x 5 = 25)

PART D

Answer Any Two. Each Question Carries 12 marks

28. Using Cayley Hamilton theorem, find A^{-1} if $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

29. Evaluate $\iiint_V \frac{dx\, dy\, dz}{(x+y+z+1)^3}$ where V is the tetrahedron bounded by the planes $x = 0$, $y = 0$, $z = 0$ and x+y+z=1.

30. Find the area of the region in the first quadrant that is bounded above by $y = \sqrt{x}$ and below by X-axis and the line $=x-2$.

31. Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy\, dx$. (12 x 2 = 24)

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