Reg. No…….. Name…… **16U240**

B.Sc. DEGREE END SEMESTER EXAMINATION MARCH 2017

SEMESTER **– 2: MATHEMATICS (COMPLEMENTARY COURSE FOR PHYSICS & CHEMISTRY)**

COURSE: **15U2CPMAT2: INTEGRAL CALCULUS AND MATRICES**

(*Common for Regular 2016 Admission / Supplementary 2015 & 2014 Admissions)*

Time: Three Hours Max. Marks: 75

PART A

Answer **all** questions. Each question Carries 1 mark

1. What is the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & 0 & 5 & 7 \end{bmatrix}$.
2. Evaluate $\int_0^1 \int_0^2 xy(x-y)dx\,dy$.
3. Write the formula for length of the smooth curve $y = (x)$ from a to b.
4. State the mean value theorem for Definite Integrals.
5. Express the $\lim_{||P||\to 0} \sum_{k=1}^{n} c_k^2\,\Delta x_k$, where P is a partition of [0,2].
6. State Fubini's theorem in first form.
7. Find the eigen values of the matrix. $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 8 \end{bmatrix}$
8. Write the formula for evaluating area of a closed bounded region R in the polar coordinate plane.
9. State Cayley Hamilton theorem.
10. Show that the eigen values of a diagonal matrix are the same as its diagonal elements. (1 x 10 = 10)

PART B

Answer **any eight** questions. Each question Carries 2 marks

11. Find the average value of $(x) = 4 - x^2$ on [0,3].
12. Find the area of the region enclosed by the parabola $y = x^2 - 2$ and the line $y = 2$.
13. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ by reducing it into the normal form.
14. Find the area enclosed by the cardioid $r = (1 + cos\theta)$.
15. Find the length of the curve $y = \log secx$ from $x = 0$ to $x = \frac{\pi}{3}$.
16. Evaluate $\int_1^4 \left(\frac{3}{2}\sqrt{x} - \frac{4}{x^2}\right) dx$.
17. Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z}\,dx\,dy\,dz$.
18. If $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$, find A^{-1} using Cayley Hamilton theorem.
19. Find the volume of the solid generated by revolving the region bounded by the curve $y = x^2$ and the lines y=0, x=2 about the x axis.
20. Evaluate $\int_2^a \int_2^b \frac{1}{xy}\,dx\,dy$. (2 x 8 = 16)

PART C

Answer **any five** questions. Each question carries 5 marks

21. Find the Eigen values and the corresponding Eigen vectors of the matrix.
$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & 4 & \_3 \end{bmatrix}$$
22. Find by double integration, the area which lies inside the cardioid $r = 1 + cos\theta$ and outside the circle r = 1.
23. Estimate the sum of the square roots of the first n positive integers $\sqrt{1} + \sqrt{2} + \cdots \ldots . + \sqrt{n}$.
24. Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x\, dz\, dx\, dy$.
25. Using limits of Riemann sums, compute $\int_0^1 x^3\ dx$.
26. 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.
27. Find all non trivial solutions of $x_1 + 3x_2 + 2x_3 = 0$; $2x_1 - x_2 + 3x_3 = 0$; $3x_1 - 5x_2 + 4x_3 = 0$; $x_1 + 17x_2 + 4x_3 = 0$.

(5 x 5 = 25)

PART D

Answer **any two** questions. Each question carries 12 marks.

28. State and prove the first fundamental theorem of calculus.
29. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dx\, dy$ by changing into polar coordinates. Hence find the value of $\int_0^\infty e^{-x^2} dx$.
30. Using Cayley Hamilton theorem, find A^{-1} if $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.
31. Find the volume of the region D enclosed by the surfaces $z = x^2+3y^2$ and $z = 8 - x^2 - y^2$.

(12 x 2 = 24)

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