Name:.....

Reg. No.....

BSC DEGREE END SEMESTER EXAMINATION MARCH 2016

(Common for 2015 Admission & 2014 Admission - Supplementary)

SEMESTER - 2: COMPLIMENTARY COURSE FOR PHYSICS AND CHEMISTRY

COURSE CODE: 15U2CPMAT2 – INTEGRAL CALCULUS AND MATRICES

Time: Three Hours. Maximum. Marks: 75

Part A

Answer all Questions

Each Question Carries 1 mark

1. Evaluate $\int_0^3 \int_0^2 (4 - y^2) dy\, dx$.
2. Find the characteristic equation of the matrix $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$.
3. Find the area of the region enclosed by the line $x = 2y^2$, $x = 0$ and $y = 3$.
4. State the fundamental theorem of calculus.
5. Evaluate $\int_{-1}^{1} (1 - |x|) dx$.
6. Write the volume of solid of revolution of the continuous function $y = R(x)$ from a to b about the x axis.
7. Define the rank of a matrix.
8. State Fubini's theorem in first form.
9. Show that if λ is an eigen value of a non singular matrix A, then $\frac{1}{\lambda}$ is an eigen value of A^{-1}.
10. Define the normal form of a matrix.

Part B

Answer Any Eight

Each Question Carries 2 marks

11. Verify Cayley Hamilton theorem for $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.
12. Change in to polar coordinates $\int_0^1 \int_0^{\sqrt{1-x^2}} (x^2 + y^2)\, dy\, dx$ and evaluate
13. Evaluate $\iint_R y\, dy\, dx$ where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.
14. Find the length of the curve $y = x^{\frac{3}{2}}$ from x=0 to x=4.

15. Evaluate $\int_0^{\pi} sin^2\frac{x}{4}\ cos\frac{x}{4}\ dx$.
16. Use the inequality $cosx \geq 1 - \frac{x^2}{2}$, which holds for all x, to find a lower bound for the value of $\int_0^1 cosx\ dx$.
17. 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.
18. By reducing to Echelon form , find the rank of $\begin{bmatrix} 1 & 6 & -18 \\ -4 & 0 & 5 \\ -3 & 6 & -13 \end{bmatrix}$.
19. Find the area of the region enclosed by the parabola $x = y^2$ and the line $x = y + 2$.
20. Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z)\ dz\ dx\ dy$.

Part C
Answer Any Five
Each Question Carries 5 marks

21. Find the area of the region between the curve $y = x^2 - 6x + 8$, $0 \leq x \leq 3$.
22. Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, about the x axis.
23. State and prove the mean value theorem for definite integrals.
24. Evaluate $\int_0^1 \int_{x^2}^{2-x} xy\ dx\ dy$ by changing the order of integration.
25. Find the rank of the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ using normal form.
26. Find the area enclosed by the lemniscate $r^2 = 4\ cos2\theta$.
27. Solve by Cramer's rule: 5x+3y+3z = 48;
    2x+6y-3z = 18;
    8x-3y+2z = 21.

Part D
Answer Any Two
Each Question Carries 12 marks

28. Evaluate $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy\ dx$.
29. Find the area of the region between the curve $y = x^3$ and x axis on the interval [0,b], where b>0 using Riemann sum.
30. 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.
31. Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence find A^{-1}.