TB162490B **Reg. No: ....**

Name: ....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
(2016 Admission - Regular & 2015 Admission – Supplementary / Improvement)
SEMESTER II - COMPLEMENTARY COURSE (MATHEMATICS)
MT2CPC02B – PARTIAL DERIVATIVES, MULTIPLE INTEGRALS, TRIGNOMETRY AND MATRICES
(For Physics & Chemistry)

Time: Three Hours **Maximum Marks: 80**

PART A

I. Answer all questions. Each question carries 1 mark.

1. State Fubini's Theorem.
2. Evaluate $\int_0^1 \int_0^2 (4 - x - y)\ dxdy$
3. Prove that $cosh2x = 1 + 2\ (sinhx)^2$
4. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ where $f(x,y) = \log(x^2 + y)$
5. Find the real part of $\cos(\alpha + i\beta)$
6. Define rank of a Matrix.

(6x1 = 6)

PART B

II. Answer any seven questions. Each question carries 2 marks.

7. Evaluate $\iint_R \frac{x}{y}\ dA$ where R is the region in the first quadrant bounded by the lines $y = x,\ y = 2x,\ x = 1\ and\ x = 2.$
8. Find the average value of $f(x,y) = xcos(xy)$ over the rectangle R: $0 \le x \le \pi$, $0 \le y \le 1$
9. Evaluate $\int_0^1 \int_0^\pi \int_0^\pi ysinz\ dzdydx$
10. Prove that $cos4\theta = cos^4\theta - 6\ cos^2\theta sin^2\theta + sin^4\theta$
11. If $\sin(A + iB) = x + iy$ prove that $\frac{x^2}{sin^2A} - \frac{y^2}{cos^2A} = 1$
12. Separate into real and imaginary parts of the expression $\cosh(\alpha + i\ \beta)$
13. Find the values of $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at the point (4, -5) if $f(x,y) = x^2 + 3xy + y - 1$
14. Find all the second order partial derivatives of $f(x,y) = xe^y + cox(xy)$
15. Reduce to normal form the matrix $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$
16. Obtain the row equivalent canonical matrix of $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 5 & -4 \end{bmatrix}$

(7x2 =14)

PART C

III. Answer any five questions. Each question carries 6 marks.

17. Change the order of integration and evaluate $\int_0^{\pi}\int_x^{\pi}\frac{siny}{y}\,dydx$
18. Find the area enclosed by one leaf of the rose $r = 12\,cos3\theta$
19. Separate into real and imaginary parts the quantity $tan^{-1}(\alpha + i\beta)$
20. Prove that Prove that $sin^6\theta = \frac{-1}{32}(cos6\theta - 6cos4\theta + 15cos2\theta - 10$
21. Show that $\frac{\partial^2 f}{\partial x^2}+\frac{\partial^2 f}{\partial y^2}+\frac{\partial^2 f}{\partial z^2}=0$ if $f(x,y,z) = (x^2+y^2+z^2)^{-1/2}$
22. Find $\frac{dw}{dt}$ if $w = xy + z;\ \ x = cost,\ \ y = sint,\ \ z = t\ at\ t = 0$
23. Show that the system of equation is consistent and solve

$$x + y + z = 6$$
$$x - y + 2z = 5$$
$$3x + y + z = 8$$

24. Find the eigen values and one of the eigen vectors of the matrix $\begin{bmatrix}1 & 2\\ 3 & 2\end{bmatrix}$

(5x6 =30)

PART D

IV. Answer any two questions. Each question carries 15 marks.

25. a) Changing to polar coordinates evaluate $\int_0^1\int_0^{\sqrt{1-x^2}}(x^2+y^2)dydx$

    b) Evaluate $\int_0^{\sqrt{2}}\int_0^{3y}\int_{x^2+3y^2}^{8-x^2-y^2}dzdxdy$
26. Sum the series $\frac{1}{2}sin\alpha + \frac{1.3}{2.4}sin2\alpha + \frac{1.3.5}{2.4.6}sin3\alpha + \cdots\infty$
27. a) Draw the tree diagram for both chain rule equations for two independent variables and three intermediate variables

    b) Express $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ in terms of r and s if

    $w = x + 2y + z^2,\quad x = \frac{r}{s},\quad y = r^2 + logs,\quad z = 2r$
28. State Cayley Hamilton Theorem. Using Cayley Hamilton Theorem find the A^{-1} for

$$A = \begin{bmatrix}2 & -1 & 1\\ -2 & 2 & -1\\ 1 & -1 & 2\end{bmatrix}$$

(2x15 =30)