B.Sc. DEGREE (CBCSS) EXAMINATION APRIL 2015
SECOND SEMESTER- CORE COURSE (MATHEMATICS)
MAT2AGTM – ANALYTIC GEOMETRY, TRIGONOMETRY AND MATRICES
(COMMON FOR B.SC MATHEMATICS AND B.SC COMPUTER APPLICATIONS)

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

Part A (Short Answer   Questions)
Answer *all* questions. Each Question carries 1 mark.

1.Write the curve whose parametrization is given by $x = a\cos t$, $y = b\sin t$.

2. Find the eccentricity and foci of the ellipse $2x^2 + 3y^2 = 6$.

3.What is the maximum number of normals that can be drawn from a given point to an
   ellipse.

4. Define conjugate diameters of an ellipse.

5.Write the polar equation of a conic.

7. What is the real part of *cos(A+ iB)*.

8. Define hyperbolic cosine of x.

9. What is the rank of a nonsingular matrix

10.Write the Normal form of a matrix.

10. Write the characteristic equation of a square matrix A.

                                                     (10 x 1 = 10)

Part B (Short Answer   Questions)
Answer any *eight* questions. Each question carries 2 marks.

11. The chord joining two points 't$_1$' and   't$_2$' on the parabola y^2 = 4ax passes through the
    focus. Prove that t$_1$t$_2$ = -1.

12. A hyper bola passes through (1,1) and its asymptotes are x + y -1 = 0
    and x - y – 2 = 0. Find the equation to the hyperbola.

13. Determine the length of an equi - conjugate diameter of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

14. Define conjugate hyperbola and write its equation.

15.Define a rectangular hyperbola and write the equation of its asymptotes.

16. Find the polar equation of a circle.

17. Prove that *sinh (x+ y)= sinhx coshy + coshx sinhy*

18 .Show that tan(ix) = i tanhx.

19. Find *log (-1)*

20. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$

21. State Cayley Hamilton theorem.

22. Find the eigean values of the matrix $\begin{bmatrix} -2 & -1 \\ 5 & 4 \end{bmatrix}$

(8 x 2 = 16)

Part C (Short Essay Questions)
Answer any *six* questions. Each question carries 4 marks

23. Find the equation of the asymptotes to a hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$

24. Find the condition that the line $lx+my+n = 0$ is a normal to the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.

25. Prove that the tangents at the ends of a pair of conjugate diameters of an ellipse form a parallelogram of constant area.

26. Find the polar equation of the normal to a conic.

27. Separate into real and imaginary parts $tan^{-1}(x+iy)$.

28. Factorise $x^7 - 1 = 0$

29. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ find A^2 and A^3 using Cayley Hamilton theorem.

30. Reduce the matrix $\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ into Normal form.

31. Solve by matrix method $2x-y+3z = 9$, $x+y+z = 6$, $x-y+z = 2$.

(6 x 4 = 24)

Part D (Essay Questions)
Answer any *two* questions. Each question carries 15 marks.

32. Find the locus of the middle points of normal chords of an ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$

33. Prove that the orthocenter of any triangle inscribed in a rectangular hyperbola lies on the curve.

34. Sum to infinity the series $c \sin + c^2/2 \sin 2 + c^3/3 \sin 3 + - - - - - - - - - - - -$

35. Determine the characteristic roots and the associated characteristic vectors of the matrix

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

(2 x 15 = 30)