SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E/B.Tech – Common to ALL Branches (Excepts to Bio Groups)
Title of the paper: Engineering Mathematics - I

Semester: I	Max.Marks: 80
Sub.Code: 3ET102A-4ET102A-5ET102A	Time: 3 Hours
Date: 14-05-2009	Session: AN

PART - A (10 X 2 = 20)

Answer ALL the Questions

1. Show that $\frac{\cos 3\theta}{\cos \theta} = 4\cos^2 \theta - 3$

2. Separate into real and imaginary parts of cos(x+iy)

3. Find the direction cosines of the line joining points (2,3,5) and (1,-3,2).

4. Find the centre and radius of the sphere $4(x^2+y^2+z^2) - 8x + 12y - 16z - 20 = 0$.

5. Find the rank of matrix. $\begin{bmatrix} 3 & 4 & -6 \\ 2 & -1 & 7 \\ 1 & -2 & 8 \end{bmatrix}$

6. Find the sum and product of eigen values of the matrix $\begin{bmatrix} 1 & -4 & 4 \\ 1 & -2 & 4 \\ 2 & -1 & 3 \end{bmatrix}$

7. Evaluate $\int_0^1 \int_0^2 xy^2 \, dydx$

8. Sketch roughly the region of integration for the double integral $\int_0^1 \int_0^x f(x,y)dxdy$.

9. Evaluate $\int_0^{\pi/2} \sin^7\theta \cos^5\theta \, d\theta$

10. Write the relation between Beta and Gamma functions.

PART – B (5 x 12 = 60)

Answer All the Questions

11. Expand $\text{Sin}^4\theta\text{Cos}^3\theta$ in a series of cosines of multiples of θ.

(or)

12. It cos(u+iv) = x+iy where u,v,x,y as real, prove that
(i) $(1+x)^2 + y^2 = (\text{Coshv} + \cos u)^2$
(ii) $(1-x)^2 + y^2 = (\text{Coshv} - \text{Cos } u)^2$

13. Find the Shortest distance between the lines $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ *and* $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ Find also the equation to the line of shortest distance.

(or)

14. Find the equation of the sphere which touches the plane 3x+2y-z+2=0 at the point p(1,-2,1) and also cuts orthogonally the sphere $x^2+y^2+z^2-4x+6y+4 = 0$.

15. State Cayley–Hamilton theorem and find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$ using Cayley – Hamilton theorem hence find A^4.

(or)

16. Reduce $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ into canonical form by an orthogonal transformation.

17. Change the order of integration and hence evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$

(or)

18. Evaluate $\int_0^1 \int_0^{1-z} \int_0^{1-y-z} xyz\,dx\,dy\,dz$

19. Prove that $\Gamma(1/2) = \sqrt{\pi}$

(or)

20. Show that $\int_0^1 \frac{x^2 dx}{(1-x^4)^{1/2}} \cdot \int_0^1 \frac{dx}{(1-x^4)^{1/2}} = \frac{\pi}{4}$