Register Number | | | | | | | |

SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E/B.Tech-CSE/EIE/M&P/IT/CHEM/E&C/ ETCE/MECH/AERO

Title of the Paper: Engineering Mathematics - I Max. Marks: 80

Sub. Code: 4ET102A-5ET102A Time: 3 Hours

Date: 06/12/2010 Session: FN

PART - A (10 X 2 = 20)

Answer ALL the Questions

1. Show that $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1$

2. Evaluate $\underset{x \to \infty}{Lt}\left[\sinh^{-1} x - \log x\right]$

3. If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are the direction cosines of any line prove $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$.

4. Find the equation to the plane parallel to x+3y+5z+1=0 and is 5 units from the origin.

5. In the rank of A = $\begin{pmatrix} 2 & 1 & -1 \\ 1 & 4 & 2 \\ 3 & 5 & k \end{pmatrix}$ is 2, find the value of k.

6. Find the sum of the squares of eigenvalues of the matrix

A = $\begin{pmatrix} 3 & 0 & 0 \\ 8 & 4 & 0 \\ 6 & 2 & 5 \end{pmatrix}$

7. Evaluate $\int_0^{\pi/2} \frac{\sin^2\theta}{1+\cos\theta} d\theta$

8. Evaluate $\int_0^{2\pi}\int_0^{\pi}\int_0^{a} n^4 \sin \phi \, dr \, d\phi \, d\theta$

9. When n is positive integer, prove that $\sqrt{n+1} = n!$

10. Define Gamma and Beta functions.

PART – B (5 x 12 = 60)

Answer All the Questions

11. Expand $\sin^8\theta$ in a series of cosines of multiple of θ.

(or)

12. If x + iy = sin (A+iB) prove that $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} + = 1 \; and \; \frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$

13. Find the length and the equations of the shortest distance between the lines

$$x - 10 = \frac{y - 9}{3} = \frac{z + 2}{-2}$$

(or)

14. Find the equation of the sphere which has its centre at the point (-1,2,3) and touch the plane zx – y + 2z = 6.

15. Using cayley.Hamilton theorem find A^{-1} if $A = \begin{pmatrix} 1 & 2 & -2 \\ 2 & 5 & -4 \\ 3 & 7 & -5 \end{pmatrix}$;

Also verify the theorem.

(or)

16. Reduce the equation form $10x^2 + 2y^2 + 5z^2 + 6yz - 10zx - 4xy$ to a canonical form.

17. When n is a positive integer find a reduction formula for $\int \sin^n x \, dx$

(or)

18. Evaluate $\int_0^3 \int_0^{\sqrt{4-y}} (x + y) \, dx \, dy$ by changing the order of integration.

19. Prove that $\beta(m, n) = \frac{\sqrt{m}\,\sqrt{n}}{\sqrt{m+n}}$, the relation between Gamma and Beta functions.

(or)

20. Prove that $\beta(m, n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}} dx$

Hence deduce that $\beta(m, n) = \int_0^1 \frac{x^{m-1} + x^{x-1}}{(1+x)^{m+n}} dx$