SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

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

Semester: II	Max. Marks: 80
Sub.Code: 6C0016	Time: 3 Hours
Date: 24-05-2008	Session: FN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Give the expansion of tanθ upto 5^{th} degree.
2. Separate the real and imaginary part of cosh(x + iy).
3. Find the equation to the plane through the point (1,2,3) and parallel to 3x + 4y + z + 5 = 0.
4. Find the equation to the sphere with centre (1, 2, 1) and touching the plane z = 0.
5. Give two integers such that their Gamma values are equal.
6. Write $\int_0^{\pi/2} \cos^{2m}\theta \sin^{2n}\theta d\theta$ in terms of Beta integral.
7. Find the directional derivative of $x^2 + 2xy$ at (1, –1, 3) in the direction of x axis.
8. $\int \vec{F}.\bar{dr}$ is independent of the path when?
9. Shade the region of integration $\int_0^2 \int_0^y dxdy$.
10. Evaluate $\int_0^{\pi/2} \sin^5\theta \cos^6\theta d\theta$.

PART – B (5 x 12 = 60)

Answer All the Questions

11. (a) Prove that

$\cos^4\theta\sin^3\theta = \frac{1}{2^6}(3\sin\theta + 3\sin 3\theta - \sin 5\theta - \sin 7\theta)$.

(b) If $\tanh\frac{u}{2} = \tan\frac{\theta}{2}$ prove tha coshu = secθ.

(or)

12. (a) If $\frac{\sin\theta}{\theta} = \frac{5045}{5046}$ prove that θ is 1º 58' nearly.

(b) If $\sin(\theta+i\phi) = \cos\alpha + i\sin\alpha$ prove that $\cos 2\theta = \pm\sin\alpha$.

13. (a) Find the equation of one plane passing through the line of intersection of $2x + 3y - 4z = 8$ and $4x - y + z = 7$ and which is perpendicular to the yx – plane.

(b) Show that the plane $2x - 2y + z = 9$ touches the sphere touches the sphere $x^2 + y^2 + z^2 + 2x + 2y - 7 = 0$ and find the point of contact.

(or)

14. (a) Find the shortest distance and its equation between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}; \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$.

(b) Find the equation of the sphere that passes through the circle $x^2 + y^2 + z^2 + x - 3y + 2z = 1$, $2x + 5y - z + 7 = 0$ and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 3x + 5y - 7z - 6 = 0$.

15. (a) Prove that $\beta(m, n) = \frac{\lceil m \lceil n}{\lceil m+n}$

(b) Evaluate $\int_0^1 x^m(1-x^n)^p\,dx$ in terms of Gamma function.

(or)

16. (a) Evaluate $\int x^m (\log \frac{1}{x})^n dx$

(b) Evaluate $\iint_A x^p y^q dxdy$ where A is the area enclosed by x=0, y=0 and x + y = 1.

17. (a) Find the tangent plane to the surface $xz^2 + x^2y - z + 1 = 0$ at (1, –3, 2).

(b) Find $\iint_S F.\overline{dS}$ where $\overline{F} = (2x+3z)\vec{i} - (xz+y)\vec{j} + (y^2+2z)\vec{k}$ where S is the surface of the sphere having centre at (3, –1, 2) and radius = 3.

(or)

18. (a) Prove that $\nabla^2 r^n = n(n+1)r^{n-2}$.

(b) Find $\int_c \vec{F}.\overline{dr}$, $\overline{F} = 4x\vec{i} - 2y^2\vec{j} + z^2\vec{k}$ where S is the upperhalf of the surface of the sphere $x^2 + y^2 + z^2 = 1$, C is its boundary.

19. (a) Evaluate $\int_0^{\pi} \frac{x \sin x dx}{1+\cos^2 x} dx$.

(b) Change the order of integration and evaluate $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y} dydx$.

(or)

20. (a) If $I_n = \int_0^a x^n e^{-x} dx$ prove that $I_n - (n+a)I_{n-1} + a(n-1)I_{n-2} = 0$.

(b) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-x^2-y^2}} \frac{dxdydz}{\sqrt{a^2-x^2-y^2-z^2}}$.