Register Number | | | | | | | |

SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E/B.Tech-All Branches Except Bio Groups
Title of the Paper: Engineering Mathematics - II Max. Marks: 80
Sub. Code: 6C0016 (2006/07/08/09) Time: 3 Hours
Date: 04/12/2010 Session: AN

PART - A (10 X 2 = 20)

Answer ALL the Questions

1. Expand $\tan 6\theta$ in terms of powers of $\tan\theta$.

2. If $x + iy = C \cos(A - iB)$ show that $\frac{x^2}{C^2 Cosh^2 B} + \frac{y^2}{C^2 Sinh^2 B} = 1$.

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

4. Prove that the two spheres $x^2+y^2+z^2-2x+4y-4z = 0$ and $x^2+y^2+z^2+10x+2z+10=0$ touch each other.

5. Define Beta and Gamma functions.

6. Prove that $\frac{\beta(m+1,n)}{\beta(m,n+1)} = \frac{m}{n}$.

7. Show that $F = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)\,j + (3xy - 2xz + 2z)\,k$ is irrotational.

8. State Green's theorem in a plane.

9. Prove that $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_{0}^{a} f(x)dx, if\ f(x)\ is\ even \\ 0, if\ f(x)\ is\ odd \end{cases}$

10. Evaluate $\int_{0}^{1}\int_{0}^{z}\int_{0}^{y+z} dzdydx.$

PART – B (5 x 12 = 60)

Answer All the Questions

11. Expand Cos8θ in a series of powers of (i) Sinθ only and (ii) Cosθ only.

(or)

12. If tanh (x/2) = tan (θ/2), show that x = log tan (π/4 + θ/2) and conversely.

13. Show that the lines $\frac{x-4}{2} = \frac{y-5}{3} = \frac{z-6}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar and find the equation of the plane in which they lie.

(or)

14. Find the equation of the sphere passing through the points (1,1,-2) and (-1,1,2) and having its centre on the line x + y – z – 1 = 0 = 2x – y + z – 2.

15. Prove that β(m,n) = $\int_{0}^{\infty} \frac{x^{m-1}}{(1+x)^{m+n}} dx.$ Hence deduce that β(m,n) = $\int_{0}^{1} \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx.$.

(or)

16. Express $\int_{0}^{1} x^{p}(1-x^{q})^{m} dx$ in terms of Gamma functions.

Hence Evaluate $\int_0^1 x^3(1-\sqrt{x})\,dx$

17. Verify Stokes theorem when $F = (2xy - x^2)i - (x^2 - y^2)j$ and C is the boundary of the region enclosed by the parabolas $y^2 = x$ and $x^2 = y$.

(or)

18. Verify Gauss divergence theorem for $F = x^2i + y^2j + z^2k$ where S is the surface of the cuboid formed by the planes $x = 0$, $x = a$, $y = 0$, $y = b$, $z = 0$ and $z = c$.

19. Find a reduction formula for $\int \sin^n x\,dx$ (n is positive integer)

(or)

20. Change the order of integration in $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} dy\,dx$

and then evaluate it.