SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.E/B.Tech – Common to ALL Branches (Except Bio groups)
Title of the Paper :Engineering Mathematics – II Max. Marks :80
Sub. Code :6C0016 Time : 3 Hours
Date :10/05/2010 Session :FN

PART - A (10 x 2 = 20)
Answer ALL the Questions

1. If tan(x/2) = tanh(y/2) prove that cosxcoshy = 1.

2. If $x+\frac{1}{x}=2\cos\alpha, y+\frac{1}{y}=2\cos\beta, z+\frac{1}{z}=2\cos\gamma,$ prove that $xyz+\frac{1}{xyz}=\cos(\alpha+\beta+\gamma).$

3. Find the equation of the line passing through (2,3,4) and perpendicular to the plane y+3x+2z=6.

4. Find the coordinates of centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 4x + 8y + 10z + 9/2 = 0$.

5. Evaluate I = $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta d\theta}$

6. Evaluate $\int_0^{\infty} x^6 5^{-x} dx.$

7. Find the directional derivative of $f(x,y,z) = 2x^2 + 3y^2 + z^2$ at the point P(2,1,3) in the direction of **a = i – 2k.**

8. Evaluate $\iint_S (x^3\, dydz + x^2 ydzdx + x^2 zdxdy)$, where S is the surface of the cube x = 0, y = 0, z = 0, x=1, y=1, z=1.

9. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$

10. Evaluate $\int_0^a \int_0^b (x+y)dxdy.$

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. (a) Solve approximately $\cos(\frac{\pi}{3} + \theta) = 0.49.$

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

(or)

12. Expand $\cos^5\theta \sin^7\theta$ in a series of sines of multiples of θ.

13. (a) The plane x – y – z = 2 is rotated through 90° about its line of intersection with the plane x + 2y + z = 2. Find its equation in the new position.

(b) Find the equation of the spheres passing through the circle $x^2 + y^2 + z^2 - 6x - 2z + 5 = 0$, y = 0 and touching the plane 3x + 4z + 5 = 0.

(or)

14. Find the shortest distance and its equation between the lines.

$\frac{x-6}{3} = \frac{y-7}{-1} = \frac{z-4}{1} \; and \; \frac{x}{-3} = \frac{y+9}{2} = \frac{z-2}{4}.$

15. Prove $\beta(n,\frac{1}{2}) = 2^{2n-1}\beta(n,n)$ and hence deduce the duplication formula.

(or)

16. (a) Evaluate $\int_0^1 \frac{dx}{\sqrt{\log(1/x)}}$.

(b) Prove that β(m,n) = Γ (m) Γ(n) / Γ(m+n).

17. Verify divergence theorem for F = (x2 – yz)I + (y2 – zx)j + (z2 – xy)k taken over rectangular parallelepiped 0 ≤ x ≤ a, 0 ≤ y ≤ b, 0 ≤ z ≤c.

(or)

18. Determine f(r) so that the vector f(r) r is both solenoidal and irrotational.

19. (a) Evaluate by changing the order of integration $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{xdydx}{\sqrt{x^2+y^2}}$.

(b) Derive the reduction formula for $\int_0^{\pi/2} \sin^m x \cos^n x dx.$

(or)

20. (a) Evaluate $\int_0^{\log a} \int_0^x \int_0^{x+y} e^{(x+y+z)} dzdydx.$

(b) Prove that $\int_0^{\pi/2} \log \sin x dx = -\frac{\pi}{2}\log 2.$