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
Semester: II Max. Marks: 80
Sub.Code: ET202A(2002/2003/2004/2005) Time: 3 Hours
Date: 04-12-2008 Session: AN

PART – A (10 x 2 = 20)
Answer All the Questions

1. Show that $x^7 - 3x^4 + 2x^3 - 1 = 0$ has atleat four imaginary roots.
2. If α, β, γ are the roots of the equation $3x^3 + 6x^2 - 9x + 2 = 0$ find the value of $\sum \frac{\alpha}{\beta}$.
3. Find the radius of curvature at (1, 0) on $x = e^t \text{Cos}t$, $y = e^t \text{Sin } t$.
4. Find the envelope of the family of lines $y = mx + am^2$.
5. Obtain the particular integral of $(D^2 - 2D + 5)\, y = \text{Cos } 2x$.
6. Solve the equation $\left(\frac{dy}{dx}\right)^2 - 8\frac{dy}{dx} + 15 = 0$.
7. The time period of a particle executing simple harmonic motion is 20 seconds. Four seconds after it passes through the centre of oscillation, its velocity is 3 m/s. Find its amplitude.
8. A particle falls under gravity in a medium whose resistance is mk times the velocity. Write the equation of motion of particle.
9. Find the directional derivative of $\phi = x^2 y^2 z^2$ at the point (1, 1, 1) in the direction $\hat{i} + \hat{j} + \hat{k}$.
10. Find the value of 'a' so that the vector $\overline{F} = (x + 3y)\hat{i} + (ay - 3z)\hat{j} + (x = 3z)\hat{k}$ is solenoidal.

PART – B (5 x 12 = 60)

Answer All the Questions

11. Find the equation whose root are the reciprocal of the roots of $x^4 - 7x^3 + 8x^2 + 9x - 6 = 0$.

(or)

12. Transform the equation $2x^3 - 9x^2 + 13x - 6 = 0$ into one in which the second term is missing and hence solve the given equation.

13. Find the equation of circle of curvature of the parabola $y^2 = 12x$ at the point (3, 6).

(or)

14. A rectangle box open at the top is to have a volume of 32cc. Find the dimension of the box, that requires the least material for its construction.

15. Solve $x^2 D^2 y - 2xDy - 4y = x^2 + 2\log x$.

(or)

16. Solve $\frac{dx}{dt} + 2y = Sin\,2t, \frac{dy}{dt} - 2x = Cos\,2t$.

17. An electric circuit contains a resistance R and condenser of capacitance C in series and an emf E Sin ωt applied to it. The charge on the condenser is given by $R\frac{dq}{dt} + \frac{q}{c} = ESin\ \omega t$. Find q where the initial charge on the condenser is zero.

(or)

18. The differential equation satisfied by a beam with a uniform loading ω Kg/m with one end fixed and other end subject to a tensile force P is given by $EI\frac{d^2y}{dx^2} = py - \frac{\omega x^2}{2}$. Find the equation to the elastic curve subject to boundary conditions y = 0 at x = 0 and $\frac{dy}{dx} = 0$ at x = 0.

19. Show that $\nabla^2 r^n = n(n+1)r^{n-2}$ andhencede duce $\nabla^2\left(\frac{1}{r} = 0.\right)$

(or)

20. Verify Gauss divergence theorem for $\overline{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ over the cube bounded by x = 0, x = 1, y = 0, y = 1. z = 0 and z = 1.