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: ET202A (2002/2003/2004/2005)　　　　Time: 3 Hours
Date: 30-04-2007　　　　Session: FN

PART – A　　　　(10 x 2 = 20)

Answer ALL the Questions

1. If α, β, γ are the roots of $x^3 - 14x + 8 = 0$, find $\Sigma\alpha^2$.
2. Diminish by 3 the roots of $x^4 + 3x^3 - 2x^2 - 4x - 3 = 0$.
3. Find the curvature of the circle $x^2 + y^2 = 49$.
4. Find the envelope of $y = mx + \sqrt{a^2m^2 + b^2}$ where m is a parameter.
5. Solve $(D^2 + 4)y = \sin 2x$.
6. Solve $x\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} = 0$
7. What is the period of this simple harmonic motion if the particle is moving on a straight line and its distance from a fixed point O on it, is x, and the velocity at time t and distance x is v. The relation connecting V an X is $4v^2 = 25 - x^2$.
8. Define deflected curve.
9. State Gauss-Divergence theorem.
10. Show that $\bar{f} = (6xy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational.

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. (a) Solve $x^6 + 2x^5 + 2x^4 - 2x^2 - 2x - 1 = 0$. (8)

(b) Find k, if the equation $2x^3 - 9x^2 + 12x + k = 0$ has a double root. (4)

(or)

12. (a) If α, β, γ are the roots of $x^3 + 2x^2 + 3x + 3 = 0$, find $\sum \frac{\alpha^2}{(\alpha+1)^2}$.

(b) Diminish the roots of $3x^3 + 8x^2 + 8x + 12 = 0$ by 4.

13. Find the evolute of $x^{2/3} + y^{2/3} = a^{2/3}$.

(or)

14. A rectangular box open at top is to have a given capacity k, find the dimensions of the box requiring least material for its construction.

15. (a) Solve $y'' + y = \tan x$ by the method of variation of parameter.

(b) Solve $(D^3 + D^2 - D - 1)y = \cos 2x + 7e^x + x^2$.

(or)

16. (a) Solve $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = x^2$.

(b) Solve $\frac{dx}{dt} + y = \sin t$; $\frac{dy}{dt} + x = \cos t$

17. (a) ω and ω_o are unequal positive constants and $\frac{d^2y}{dt^2} + \omega_o^2 y = \cos \omega t$. Given y(0) = 0, y'(0) = 0, show that

$$y = \frac{\cos \omega t - \cos \omega_0 t}{\omega_0^2 - \omega^2}$$

(b) Determine the bending curve given $\frac{d^2y}{dx^2} = \frac{P(I-x)}{EI}$ and

y = 0, $\frac{dy}{dx} = 0$ at x = 0.

(or)

18. A particle of mass m, falling under gravity is experiencing a resistance equal to mg/k^2 times the square of its velocity. Find (i) its velocity (ii) the distance covered by it, at time t given that it starts from rest.

19. (a) Prove that $\nabla^2 r^n = n(n+1)r^{n-2}$ where $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$

(b) Prove $\overline{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$ is a conservative force. Find φ so that $\nabla\phi = \overline{F}$.

(or)

20. Given the vector $\overline{F} = (x^2 - y^2)\hat{i} + 2xy\hat{j} + (y^2 - xy)\hat{k}$ verify Gauss-Divergence theorem over the cube with centre at the origin and of side length a.