SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch: B. E/B. Tech - Common to ALL Branches
Title of the paper: Engineering Mathematics - II
Semester: II Max. Marks: 80
Sub.Code: ET 202A (2002/2003/2004/2005) Time: 3 Hours
Date: 04-12-2006 Session: AN

PART – A (10 x 2 = 20)

Answer ALL the Questions

1. Find the condition that the roots of the equation $x^3 + px^2 + qx + r = 0$ may be in Arithmetic progression.

2. Diminish by 3 the roots of $x^4 + 3x^3 - 2x^2 - 4x - 3 = 0$.
3. Find the radius of curvature at $x = c$ on $xy = c^2$.
4. Define an evolute.
5. Find the Particular Integral of $(D^2 + 4)y = \sin 2x$.
6. Solve $(D^2 - 6D + 9)y = 6e^{3x}$.
7. Define simple Harmonic motion.
8. The whirling speed of a shaft of length 'l' is given by

   $\frac{d^4y}{dx^4} = \frac{p\omega^2}{gEI}\, y$. If $\alpha^4 = \frac{p\omega^2}{gEI}$, find y.

9. Find the directional derivate of $\phi = 4xz^2 + x^2yz$ at $(1, -2, 1)$ in the direction of $2\vec{i} + 3\vec{j} + 4\vec{k}$.

10. Find λ if $(2x + y)\vec{i} + (z - \lambda y)\vec{j} + (2\lambda z - x)\vec{k}$ is solenoidal

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. Solve $x^5 + 4x^4 + x^3 + x^2 + 4x + 1 = 0$.

(or)

12. Solve $4x^4 - 20x^3 + 33x^2 - 2x + 4 = 0$.

13. Find the radius of curvature at θ on $x = 3a\cos\theta - a\cos 3\theta$, $y = 3a\sin\theta - a\sin 3\theta$.

(or)

14. Find the evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

15. Solve $\frac{dx}{dt} + 2y = \sin 2t$, $\frac{dy}{dt} - 2x = \cos 2t$.

(or)

16. Solve $y'' + 4y = \tan 2x$ by the method of variation of parameters.

17. In an L – C – R circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = E\sin pt$. The circuit is tuned to resonance so that $p^2 = \frac{1}{LC}$. If at t = 0, i = 0 and q = 0, show that for small values of $\frac{R}{L}$, $i = \frac{Et}{2L}\sin pt$.

(or)

18. A particle is executing a simple Harmonic motion $\frac{d^2x}{dt^2} = -\mu^2 x$. At t = 0, $x = a$ and velocity $v = 0$. Find the time taken to go from the position $x = \frac{a}{2}$ to $x = a$. Also prove that this time is $\frac{1}{6}$ of the period.

19. Verify Gauss divergence theorem for $F = x^2\,\vec{i} + y^2\,\vec{j} + z^2\,\vec{k}$ taken over the cube bounded by the planes $x = 0$, $x = 1$, $y = 0$, $y = 1$, $z = 0$ and $z = 1$.

(or)

20. Evaluate by Green's theorem in the plane $\int_c (xy + y^2)\,dx + x^2\,dy$ where c is the closed curve of the region bounded by $y = x^2$ and $y = x$.