AR13 SET 01

Code: 13BS1001

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Regular Examinations, February-2014

Engineering Mathematics - I

(Common to all Branches)

Time: 3 hours **Max Marks: 70**

PART-A

Answer all Questions **[10X1=10M]**

1) a) Form a differential equation of $x = a\,Sin(\omega t + b)$

b) When do you say that a differential equation is exact?

c) Solve $\frac{d^4y}{dx^4} + 13\frac{d^2y}{dx^4} + 36y = 0$

d) Show that the function $y_1 = Sin2x$ and $y_2 = Cos2x$ are linearly

Independent solutions of $y^{II} + 4y = 0$

e) Define Jacobian of u, v with respect to x, y

f) Write Taylors expansion of $f(x, y)$ in powers of $(x - a)$ and $(y - b)$.

g) Evaluate $\int_0^5 \int_0^{x^2} x(x^2 + y^2)dxdy$

h) Write the formula to find area in Polar coordinates.

i) If $\boldsymbol{R} = x\boldsymbol{I} + y\boldsymbol{J} + Z\boldsymbol{K}$, show that $\nabla.\boldsymbol{R} = 3$

j) When do you say that a vector F is Solenoidal and Irrotational vectors?

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PART-B

Answer one question from each unit [5X12=60M]

Unit-I

2. a) Solve $(1+y^2)dx = (tan^{-1}y - x)dy$

b) A body originally at 80^0c cools down to 60^0c in 20 minutes. The temperature of the air be 40^0c.What will be the temperature of the body after 45 minutes from the original. [6M+6M]

(OR)

3. a) Solve $\frac{dy}{dx} - \frac{tany}{1+x} = (1+x)e^x\ Secy$

b) Find the Orthogonal trajectories of the Cardioids $r = a(1 - Cos\theta)$

[6M+6M]

Unit-II

4. a) Solve $(D^2 - 1)y = x\ Sin3x + Cosx$

b) Solve $(D^2 - 4D + 4)y = 8x^2e^{2x}Sin2x$ [6M+6M]

(OR)

5. Using Method of Variation of Parameters, Solve

$y^{II} - 2y^I + 2y = e^x tanx$ [12M]

Unit-III

6. Expand $e^x \log(1+y)$in powers of x and y up to terms of third degree.

(OR) [12M]

7. a) In Spherical Polar Coordinates

$x = r\,Sin\theta\,Cos\varphi, y = r\,Sin\theta\,Sin\varphi, z = r\,Cos\theta$ then Show that

$\frac{\partial(x,y,z)}{\partial(r,\theta,\varphi)} = r^2 Sin\theta$

b) Expand $f(x,y) = x^2y + 3y$ in powers of $(x-1)$ and $(y+2)$ using Taylors theorem. [6M+6M]

Unit-IV

8. Change the order of integration in $I = \int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$ and hence evaluate it. [12M]

(OR)

9. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$ [12M]

Unit-V

10. a) Find the directional derivative of $\emptyset = 5x^2y - 5y^2z + 2.5z^2x$ at the point P(1,1,1) in the direction of the line $\frac{x-1}{2} = \frac{y-z}{-2} = z$

b) Show that $\nabla^2(r^n) = n(n+1)r^{n-2}$ [6M+6M]

(OR)

11. Verify Greens theorem for $\int_C [(xy + y^2)dx + x^2dy]$ where C is bounded by $y = x$ and $y = x^2$. [12M]