# AR16

**CODE: 16BS1001** **SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B.Tech I Semester Regular Examinations, December, 2016**

**ENGINEERING MATHEMATICS – I**

**(Common to CE, EEE, ME. ECE, CSE & IT Branches)**

**Time: 3 Hours** **Max Marks: 70M**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered at one place

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**UNIT-I**

1. a) Solve the differential equation $(x+2y^3)\frac{dy}{dx}=y$. 7M

   b) If the temperature of the air is $30^o C$ and the substance cools from $100^o C$ to $70^o C$ in 15 minutes, find when the temperature will be $40^o C$. 7M

**(OR)**

2. a) Find the orthogonal trajectories of the family of confocal conics $\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1$, where $\lambda$ is the parameter. 7M

   b) Solve $\left(x^4e^x+2mxy^2\right)dx+2mx^2ydy=0.$ 7M

**UNIT-II**

3. a) Solve by the method of variation of parameters $y''-2y'+y=e^x\log x.$ 7M

   b) Solve $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=e^{-x}+\sin 2x.$ 7M

**(OR)**

4. a) Solve $\left(D^3+2D^2+D\right)y=x^2e^{2x}.$ 7M

   b) Solve $x^2\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+6y=x^2.$ 7M

**UNIT-III**

5. a) If $u=x^2+y^2+z^2, v=xy+yz+zx, w=x+y+z$, find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$. 7M

   b) Expand $e^x\sin y$ at $\left(-1,\frac{\pi}{4}\right)$ up to third degree terms using Taylor's theorem. 7M

**(OR)**

6. Find the maximum and minimum values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x.$ 14M

**UNIT-IV**

7. a) Evaluate $\iint xy\, dxdy$, over the positive quadrant of the circle $x^2 + y^2 = a^2$. 7M

   b) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dzdydx$. 7M

**(OR)**

8. a) By changing the order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy\, dydx$. 7M

   b) Evaluate $\iint r^3 drd\theta$ over the area bounded by the circles $r = 2\sin\theta$ and $r = 4\sin\theta$. 7M

**UNIT-V**

9. a) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point $(2,-1,2)$. 7M

   b) Show that $div(grad\, r^n) = n(n+1)r^{n-2}$, where $r = |\bar{r}|$. 7M

**(OR)**

10. Verify Gauss divergence theorem for the function $\bar{F} = y\bar{i} + x\bar{j} + z^2\bar{k}$ over the cylindrical region bounded by $x^2 + y^2 = 9, z = 0$ and $z = 2$. 14M



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