AR13

CODE: 13BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, November, 2016

ENGINEERING MATHEMATICS - I
(Common to All Branches)

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

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Solve $(x^2-ay)dx - (ax - y^2)dy = 0$
   b) State Newton's law of cooling.
   c) Find the roots of the auxiliary equation $D^2-D+1=0$
   d) If $f(D) = D^3-1$ then find $\frac{1}{f(D)}e^{2x}$.
   e) If $x= u(1-v)$, $y=uv$, find $\frac{\partial(x,y)}{\partial(u,v)}$
   f) Find the stationary points of $f(x,y) = x-y-xy$
   g) Evaluate $\int_0^1 \int_1^2 x^2y\, dxdy$
   h) Change into polar coordinates $\int_0^1 \int_0^{\sqrt{1-y^2}} dydx$.
   i) Find ∇f at (1,1,1) where $f = x^2+y^2+z^2$
   j) State Green's theorem in a plane .

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Form the differential equation from $y = a e^{2x} + be^{-3x} + ce^x$ by eliminating a, b and c. [6M]
   b) Solve $\frac{dy}{dx} = y\,tanx - y^2secx$. [6M]

(OR)

3. a) Solve $y \sin 2x\, dx - (1+y^2+\cos^2 x)dy = 0$ [6M]
   b) Solve $(1+y^2)\frac{dy}{dx} = tan^{-1}y - x$. [6M]

UNIT-II

4. a) Solve $(D-2)^2 y = e^{2x} + \sin 2x$. [6M]
   b) Solve $(D^2-2D+1)y = e^x / x^2$ by method of variation of parameters. [6M]

(OR)

5. a) Solve $(D^2+2) y = \cos 2x$ [6M]
   b) Solve $(D^2 + 2D +1)y = e^{-x}$ [6M]

UNIT-III

6. a) Find the Taylor series expansion of $f(x,y) = e^x \sin y$ in powers of x and y up to the terms of third degree [6M]
   b) If u = f(r, s, t) and r = x/y, s = y/z, t = z/x prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. [6M]

(OR)

7. a) If $u = x^2+y^2+z^2$, $v = xy+yz+zx$, $w = x+y+z$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$. [6M]
   b) Find the Maximum and Minimum values of $f(x,y) = x^3+y^3-3axy$ [6M]

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UNIT-IV

8. Evaluate by changing the order of integration $\int_0^1 \int_{x^2}^{2-x} xy\, dxdy$. [12M]

(OR)

9. a) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x\, dzdxdy$. [6M]

   b) Evaluate $\iint r^3 drd\theta$ over the area included between the circles r = 2sinθ and r = 4sinθ [6M]

UNIT-V

10. a) Find the directional derivative of f(x,y,z) = xy^2+yz^3 at the point (2,-1,1) in the direction of $\bar{\imath}+2\bar{\jmath}+\bar{k}$. [6M]

    b) Show that $\nabla^2 r^m = m(m+1)r^{m-2}$ where $r^2 = x^2+y^2+z^2$. [6M]

(OR)

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

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