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Code : 13BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, Jan / Feb-2016

ENGINEERING MATHEMATICS – I

(Common to All Branches)

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

PART-A

Answer all Questions **[10 x 1 = 10 M]**

1. (a) Define Exact differential equation
(b) State Newton' law of cooling
(c) Find the particular integral of the differential equation $y'' - 4y = e^{2x}$
(d) Define simple harmonic motion
(e) If $x = u(1-v), y = uv$ compute $\dfrac{\partial(x, y)}{\partial(u,v)}$
(f) If $z = u^2 + v^2$ and $u = at^2, v = 2at$ find $\dfrac{dz}{dt}$
(g) Evaluate $\int\limits_{x=0}^{1}\int\limits_{y=0}^{1}\int\limits_{z=0}^{1} x^2 y^3 z\, dx\, dy\, dz$
(h) Evaluate $\int\limits_{-1}^{2}\int\limits_{x^2}^{x+2} dy\, dx$
(i) Evaluate $\int\limits_{c} \overline{F}.d\overline{R}$, where $\overline{F} = 3xy\bar{i} - y^2\bar{j}$ and c is the curve $y = 2x^2$ from $(0,0)$ to $(1,2)$
(j) State Green's theorem in the $xy-$plane

PART-B:

Answer one question from each unit **[5 x 12=60M]**

UNIT-I

2. (a) Solve $(1+y^2)dx = (\tan^{-1} y - x)dy$
(b) If the temperature of the air is 30^0C and the substance cools from 100^0C to 70^0C in 15 minutes, find when the temperature will 40^0C

(OR)

3. (a) Solve $\dfrac{dy}{dx} + \dfrac{y}{x}\log y = \dfrac{y}{x}(\log y)^2$
(b) Find the orthogonal trajectories $r^n \sin n\theta = a^n$, where a is parameter

UNIT-II

4. (a) Solve $(D^2 + D + 1)y = (1 - e^x)$
(b) Solve $(D^2 + 1)y = \tan x$ by the method of Variation of Parameters

(OR)

5. (a) Solve $(D^2 - 3D + 2)y = e^{3x} + \sin 2x$
   (b) Solve $(D^4 + 2D^2 + 1)y = \cos x$

UNIT-III

6. (a) Expand $e^x \log(1+y)$ in powers of x & y up to the term of the third degree
   (b) A rectangular open box of capacity 32 cubic units is to be prepared. Find the dimensions of the box, to minimize the cost of painting outside of the box

(OR)

7. (a) Using Maclaurin's series expand $\log(1+x)$ up to the terms containing x^4
   (b) If $u = \tan^{-1} x + \tan^{-1} y,\ v = \dfrac{x+y}{1-xy}$, then find $\dfrac{\partial(u,v)}{\partial(x,y)}$

UNIT-IV

8. (a) Find the volume of the solid generated by the revolution of cardioid $r = a(1+\cos\theta)$ about the initial line
   (b) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dxdydz$

(OR)

9. Evaluate $\int_{0}^{1}\int_{x^2}^{2-x} xy\,dydx$ by changing the order of integration

UNIT-V

10. (a) Find the directional derivative of $xy^2 + yz^3$ at the point $(2,-1,1)$ in the direction of $\vec{i} + 2\vec{j} + 2\vec{k}$
    (b) Find $grad(\bar{r})$, where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$.

(OR)

11. Verify Stroke's theorem for $\bar{F} = (x^2 + y^2)\bar{i} - 2xy\bar{j}$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = b$.

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