AR13 SET 02

Code: 13BS1001

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

I B.Tech I Semester Regular Examinations, February-2015

ENGINEERING MATHEMATICS – I

(Common to All Branches)

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

PART –A

Answer all questions [10 x1=10M]

1 (a) Form the differential equation from y = ax + b by eliminating arbitrary constants.

(b) Find the general solution of the differential equation $e^x dx + (e^x + 1) dy = 0$.

(c) Find the solution of $(D^2 + 4) y = 0$.

(d) What is the particular integral of $(D^2 + 1) y = \cos x$.

(e) If $U = x^2 - y^2$, $V = 2xy$ then find $\partial(u,v) / \partial(x, y)$.

(f) Write the stationary points of $f(x , y) = x^2 + y^2$.

(g) Evaluate $\int_0^1 \int_0^{x^2} (x^2 + 2y)\, dy\, dx$.

(h) Convert to polar co ordinates $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dx\, dy$

(i) For any closed sphere S with center at origin find $\int_S curl\bar{F} .\ d\bar{S}$

(j) If $\bar{r} = x\,i + y\,j + z\,k$, find $\nabla . \bar{r}$

PART - B

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

UNIT-1

2 (a) Find the differential equation for all parabolas each having its latus rectum 4a and axis parallel to x-axis. [6+6=12M]

(b) Solve the differential equation $(y \cos x + \sin y + y)\, dx + (\sin x + x \cos y + x)\, dy = 0$.

(OR)

3 (a) Solve the differential equation $(1 - x^2)\frac{dy}{dx} + 2xy = x\sqrt{1 - x^2}$.

(b) Solve the differential equation $\frac{dy}{dx} + y \tan x = y^3 \sec x$. [6 +6=12M]

UNIT-II

4 (a) Solve $(D^2 + 2D + 3)x = \sin t$. [6 +6=12M]

(b) Solve $(D^3 - D)\, y = 2x + 1$.

(OR)

5 (a) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x\,e^x$.

(b) Solve the following differential equation by variation of parameters method $\frac{d^2y}{dx^2} + y = \sec x$

[6 +6=12M]

UNIT-III

6 (a) Evaluate the following integral by changing the order of integration $\int_0^{\infty}\int_0^{x} xe^{-x^2/y}\,dydx$

(b) Find the area lying inside the cardioid r = a (1+cosθ) and outside the circle r =a. [6 +6=12M]

(OR)

7 Find the volume bounded by the paraboloid $x^2 + y^2 = az$, the cylinder $x^2 + y^2 = 2ay$ and the plane z = 0. [12M]

UNIT-IV

8 Find the Taylors's series expansion of $f(x,y) = e^x \log(1+y)$ in powers of x and y up to terms of third degree. [12M]

(OR)

9 If $U = x\sqrt{1-y^2} + y\sqrt{1-x^2}$, $V = \sin^{-1}(x) + \sin^{-1}(y)$, show that U, V are functionally related and find the relationship. [12M]

UNIT-V

10 (a) Find the directional derivative of $f(x,y,z) = x y^2 + y z^3$ at the point (2, -1, 1) in the direction of the vector i + 2j + 2k.

(b) Find the divergence of $\bar{F}$ at the point (1,2,3) where $\bar{F} = 3x^2 i + 5xy^2 j + xyz^3 k$.

[6+6=12M]

(OR)

11 Evaluate $\int_s \bar{F}.d\bar{s}$ where $\bar{F} = (x+y^2)\,i - 2x\,j + 2yz\,k$ and S is the surface of the plane 2x + y + 2z in the first octant. [12M]