Code: CE1T1, ME1T1, CS1T1, IT1T1, EE1T1, EC1T1, AE1T1

I B. Tech - I Semester – Regular / Supplementary Examinations December 2016

ENGINEERING MATHEMATICS - I
(Common for all Branches)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Write any two Integrating Factors and when they are to be used to convert a non exact differential equation to exact differential equation?

b) Obtain the 1st order differential equation that is applicable to Newton's law of cooling.

c) Find the Particular Integral of $\left(D^3+1\right)y = Cosx$.

d) Write the Meclaurin's series for the function f(x) in powers of (x-2) upto 3rd degree.

e) What is the nature of Stationary points and Saddle points of a function?

f) What is the area of the circle r = 2 in the form of a double integral in Cartesian coordinates?

g) Evaluate $\iint_R xy\,dx\,dy$ where R is bounded by $x = 0$, $y = 0$, $x = a$, $y = a$.

h) What are Solenoidal and Irrotational vectors?

i) Find the unit normal vector to the surface $x^2y = 3z$ at (1,3,1).

j) Obtain the value of $\Gamma(25/2)$.

k) What is the significance of least squares method of fitting a curve?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Find the orthogonal trajectories of confocal conics,

$\frac{x^2}{a^2} + \frac{y^2}{a^2+\lambda} = 1,$ *where λ is the parameter*. 6 M

b) Solve the differential equation $\frac{d^2y}{dx^2} + a^2y = \text{Sec}\,ax$. 10 M

3. a) Find the minimum value of $x^2 + y^2 + z^2$ given that $ax + by + cz = p$. 8 M

b) Show that by Taylor's theorem, with lagranges form of reminder for any x,

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots\ldots + (-1)^{n-1}\frac{x^{2n-1}}{(2n-1)!} + (-1)^n\frac{x^{2n}}{(2n)!}\sin\theta x, \quad 0 < \theta < 1$$

8 M

4. a) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz \; dx\, dy\, dz$. 8 M

b) By changing to polar coordinates, evaluate $\iint \frac{x^2 y^2}{x^2 + y^2} dx\, dy$ over the annular region between the circles $x^2 + y^2 = a^2, x^2 + y^2 = b^2, b > a.$ 8 M

5. a) Find the constants a, b, c so that the vector $\bar{A} = (x + 2y + az)\bar{i} + (bx - 2y - z)\bar{j} + (4x + cy + 2z)\bar{k}$ is irrotational. Also find ϕ such that $\bar{A} = \nabla \phi$. 8 M

b) State Stoke's theorem and hence or otherwise evaluate $\int [(x + y)dx + (2x - z)dy + (y - z)dz]$ over the closed boundary of the triangle with vertices (0,0,0), (1,0,0) and (1,1,0). 8 M

6. a) Determine the constants 'a' and 'b' by the least squares method such that $y = ae^{bx}$ fits the following data. 9 M

x	1	1.2	1.4	1.6
y	40.17	73.196	133.372	243.02

b) Show that $\Gamma(1/2) = \sqrt{\pi}$ using $\beta \; and \; \Gamma$ integrals. 7 M