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

I B.Tech - I Semester – Regular Examinations - November 2015

ENGINEERING MATHEMATICS - I

(Common for all Branches)

Duration: 3 hours Max. Marks: 70

PART – A

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

11 x 2 = 22 M

1. a) Show that the equation $x\,dx + y\,dy = \frac{a^2(xdy - ydx)}{x^2 + y^2}$ is exact.

   b) Solve the differential equation $(D^4 - D^3 - 9D^2 - 11D - 4)y = 0$.

   c) Find the orthogonal trajectories of family of parabolas $y = ax^2$.

   d) State Rolle's theorem.

   e) Write Taylor's series of $\cos x$ in powers of $\left(x - \frac{\pi}{2}\right)$

   f) Change the order of integration of the double integration

   $$\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$$

   g) Evaluate $\int_0^{\pi} \int_0^{x} \sin y\,dy\,dx$

h) If $f(x,y,z)=3x^2y-y^3z^2$ then find grad f at the point (1, -2, -1).

i) State Gauss divergence theorem.

j) Write the normal equations to fit the parabola

$y=a+bx+cx^2$

k) Show that $\beta(m,n)=\beta(m+1,n)+\beta(m,n+1)$.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 16 x 3 = 48 M

2. a) If the air is maintained at 30^0C and the temperature of the body cools from 80^0C to 60^0C in 12 minutes, find the temperature of the body after 24 minutes from the original. 8 M

b) Solve 8 M

$$(D^2-2D+1)y=xe^x\sin x$$

3. a) Using Lagrange's Mean value theorem, show that 8 M

$$x>\log(1+x)>\frac{x}{1+x}\ if\ f(x)=\log(1+x),\forall x>0.$$

b) Find the dimensions of the rectangular box, open at the top, of maximum capacity whose surface area is 432 sq.cm. 8 M

4. a) Evaluate the integral $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2+y^2}} dxdy$

using the change of order of integration. 8 M

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$

by changing to spherical co-ordinates. 8 M

5. a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P(1,2,3) in the direction of the line PQ where Q=(5,0,4). 8 M

b) Evaluate $\int_S \overline{F}.\overline{N}\, dS$ where $\overline{F} = z\overline{i} + x\overline{j} - 3y^2 z\overline{k}$ and S is the surface $x^2 + y^2 = 16$ included in the first octant between z=0 and z=5. 8 M

6. a) Fit a least square geometric curve $y = ax^b$ to the following data. 8 M

x:	1	2	3	4	5
y:	0.5	2	4.5	8	12.5

b) Derive the relation between Beta and Gamma function.

8 M