PVP 14

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

I B.Tech - I Semester – Regular Examinations - January 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

11x 2 = 22 M

1. a) Solve $(x^2 - ay)dx = (ax - y^2)dy$.

   b) Solve $\frac{d^4x}{dt^4} + 4x = 0$.

   c) Find the orthogonal trajectory of the family of Parabolas $y^2 = 4ax$.

   d) Explain the Geometrical interpretation of Lagrange's mean value theorem.

   e) Using Maclaurin's series, expand the function $f(x) = \log(1 + x)$.

   f) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2)dxdy$.

   g) Evaluate $\int_0^a \int_0^b \int_0^c (x^2 + y^2 + z^2)dxdydz$.

   h) Show that $Curl\,grad f = 0$.

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

j) Write the Normal equations to fit a straight line $y = ax + b$.

k) Compute $\beta\left(\frac{9}{2}, \frac{7}{2}\right)$.

PART – B

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

2. a) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What would the value of N after 90 minutes? 8 M

b) Solve $(D^2 - 1)y = x \sin 3x + \cos x$. 8 M

3. a) Verify Rolle's theorem for $f(x) = (x-a)^m (x-b)^n$ where m,n are positive integers in [a, b]. 8 M

b) Find the volume of the greatest rectangular Parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. 8 M

4. a) Evaluate the integral $\int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$ by using the change of order of integration. 8 M

b) Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. 8 M

5. a) Verify Green's theorem for $\int_c [(xy + y^2)dx + x^2 dy]$ where c is bounded by y=x and $y=x^2$. 8 M

b) Verify Stokes's theorem for the vector field $f = (2x - y)i - yz^2 j - y^2 zk$ over the upper half surface of $x^2 + y^2 + z^2 = 1$ bounded by its projection on the xy-plane. 8 M

6. a) Fit a Parabola $y = a + bx + cx^2$ to the following data.

x :	2	4	6	8	10
y :	3.07	12.85	31.47	57.38	91.29

8 M

b) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1 - x^4}} dx \times \int_0^1 \frac{dx}{\sqrt{1 + x^4}}$ 8 M