Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS003

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - December, 2017

Regulation: IARE-R16

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

(Common for CSE | IT | ECE | EEE)

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

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Compute a real root of the equation $x^4 - x - 9 = 0$ by Newton Raphson method. **[7M]**

   (b) Find the polynomial such that $f(0) = 1$, $f(1) = 3$, $f(3) = 55$ using Lagrange's interpolation formula. Hence find f(2). **[7M]**

2. (a) Using Regula – Falsi method find a positive root of the equation $x^6 - x^4 - x^3 - 1 = 0$. Perform three iterations. **[7M]**

   (b) If $\sqrt{12500} = 111.803399$, $\sqrt{12510} = 111.848111$, $\sqrt{12520} = 111.892805$, $\sqrt{12530} = 111.937483$, find $\sqrt{12516}$ by Gauss backward formula. **[7M]**

UNIT – II

3. (a) By the method of least squares, fit a straight line $y = a + bx$ for the data shown in Table 1. **[7M]**

Table 1

x	1	2	3	4	5
y	12	25	40	50	65

   (b) Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2, 0.4 by Runge-Kutta method of fourth order. **[7M]**

4. (a) Fit a second degree parabola $y = a + bx + cx^2$ for the following data shown in Table 2. **[7M]**

Table 2

x	1	3	5	7	9
y	2	7	10	11	9

   (b) Using Taylor's method, solve $\frac{dy}{dx} = 2y + 3e^x$ with y(0)=1 at x = 0.2. **[7M]**

UNIT – III

5. (a) Evaluate $\iint\limits_R e^{2x-3y}dxdy$ over the triangle bounded by x=0, y=0, x+y=1. **[7M]**

   (b) Using double integration, find the area enclosed by the curve r = a(1+cosθ) between $\theta = 0$ and $\theta = \pi$. **[7M]**

6. (a) Evaluate $\int\limits_0^\infty \int\limits_0^\infty e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates. **[7M]**

   (b) Compute the volume bounded by the cylinder $x^2+y^2=4$ and the planes y+z=4 and z=0. **[7M]**

UNIT – IV

7. (a) If $\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ and $r = |\bar{r}|$, prove that the vector $f(r)\,\bar{r}$ is irrotational. **[7M]**

   (b) Verify Stoke's theorem for the vector $\bar{F} = (2x-y)\;\bar{i} - yz^2\,\bar{j} - y^2z\;\bar{k}$ over the upper half surface of the sphere $x^2+y^2\;+z^2\;=1$ bounded by its projection on xy-plane **[7M]**

8. (a) Show that $\vec{F} = \left(2xy^2+yz\right)\bar{i} + \left(2x^2y+xz+2yz^2\right)\bar{j} + \left(2y^2z+xy\right)\bar{k}$ is a conservative force field. Find its scalar potential. **[7M]**

   (b) Find the angle between the surfaces $x^2+y^2+z^2=9$ and $x^2+y^2-z=3$ at (2,-1,2). **[7M]**

UNIT – V

9. (a) Evaluate **[7M]**

      i. $\int\limits_0^\infty e^{-\left(2ax-x^2\right)}dx$

      ii. $\int\limits_0^\infty x^{3/2}e^{-x}\,dx$

   (b) Obtain the series solution of $\left(1+x^2\right)y'' + xy' - y = 0$. **[7M]**

10. (a) Show that $J_{\frac{1}{2}}(x) = \left[\sqrt{\frac{2}{\pi x}}\right]\sin x$. **[7M]**

    (b) Show that $\Gamma(n) = \int\limits_0^1 \left(\log\frac{1}{x}\right)^{n-1}dx,\;n>0$. **[7M]**

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