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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech II Semester End Examinations (Supplementary) - July, 2018

Regulation: IARE – R16

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

Time: 3 Hours **(Common to CSE | IT | ECE | EEE)** **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) Using Newton's iterative method, find the real root of $x log_{10} x = 1.2$ correct to five decimal places. **[7M]**

   (b) Given $Sin45^0 = 0.7071$, $Sin50^0 = 0.7660$, $Sin55^0 = 0.8192$, $Sin60^0 = 0.8660$, find $Sin52^0$, using Newton's forward formula. **[7M]**

2. (a) Interpolate by means of Gauss's backward formula, the population of a town for the year 1974, from the data given in Table 1 below. **[7M]**

Table 1

Year	1939	1949	1959	1969	1979	1989
Population (in thousands)	12	15	20	27	39	52

   (b) Given the values, evaluate f(9) Given the values as shown in Table 2 using Lagrange's formula. **[7M]**

Table 2

x:	5	7	11	13	17
f(x):	150	392	1452	2366	5202

UNIT – II

3. (a) Fit a second degree parabola to the following data given in Table 3: **[7M]**

Table 3

x:	0	1	2	3	4
Y=f(x):	1	1.8	1.3	2.5	6.3

(b) Apply Runge - Kutta method, find an approximate value of y for x = 0.2 in steps of 0.1 $\frac{dy}{dx} = x + y^2$, given that y=1, when x=0. **[7M]**

4. (a) The pressure and volume of gas are related by the equation $PV^{\gamma} = k$, *where* γ *and* k *are cons* tan *ts*. Fit this equation to the following observations given in Table 4 **[7M]**

Table 4

P(Kg/cm2)	0.5	1.0	1.5	2.0	2.5	3.0
V(litres)	1.62	1.00	0.75	0.62	0.52	0.46

(b) Find the value of y for x = 0.1 by RK method, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, y (0) = 1. **[7M]**

UNIT – III

5. (a) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz \; dx \; dy \; dz$. **[7M]**

(b) Evaluate $\int\int r \sin\theta d\theta$ over the cardioid r=a(1-cos θ) above the initial line. **[7M]**

6. (a) Evaluate the integral by reversing the order of integration $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy\, dx$. **[7M]**

(b) Find the volume of the solid in the first octant bounded by the planes x=0,y=0,z=0,x+2y+z=6. **[7M]**

UNIT – IV

7. (a) Check whether $\bar{f} = (6xy + z^3)i + (3x^2 - z)j + (3xz^{2-y)k}$ is irrotational and determine its scalar potential. **[7M]**

(b) Evaluate $\int_c \left[\left(xy + y^2\right) dx + x^2 dy\right]$, , where C is bounded by y=x and y=x^2 . **[7M]**

8. (a) Determine the directional derivative of the function f(x,y,z)=x^2-y^2+$2z^2$ at the point P(1,2,3) in the direction of the line PQ where Q is the point(5,0,4). **[7M]**

(b) Determine $\int_C [(x + y)\, dx + (2x - z)\, dy + (y + z)\, dz]$, , where C is the boundary of the triangle with vertices (2,0,0),(0,3,0)and (0,0,6). **[7M]**

UNIT – V

9. (a) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. **[7M]**

(b) Prove that the relation $J_n{}'(x) = \frac{n}{x} J_n(x) - J_{n+1}(x)$. **[7M]**

10. (a) Solve the series the equation $(1 - x^2) \frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = 0$. **[7M]**

(b) Prove that $\int J_3(x)\, dx = C - J_2(x) - \frac{2}{x} J_1(x)$. **[7M]**

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