INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech I Semester End Examinations (Supplementary) - January, 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

$\mathbf{UNIT} - \mathbf{I}$

1. (a) Find by Newton-Raphson method, a real root of the equation $3x = \cos x+1$, correct to 3 decimal places.

[7M]

(b) From the following Table 1, estimate the number of students who obtained marks between 40 and 45 : [7M]

Table 1 $\,$

Marks	30-40	40-50	50-60	60-70	70-80
No of students	31	42	51	35	31

2. (a) Using the Regula- Falsi method, find a real root of the equation $f(x)=x^3-5x+3$ correct to four decimal places.

[7M]

(b) From the following Table 2, use Lagrange's formula to find the form of f(x) when x=4, [7M]

Table 2

x:	0	2	3	6
f(x):	648	704	729	792

$\mathbf{UNIT} - \mathbf{II}$

3. (a) An experiment gave the following data given in Table 3:

[7M]

Table 9	Tabl	е	3
---------	------	---	---

x	350	400	500	600
у	61	26	7	2.6

It is known that x and y are connected by the relation $y=ab^x$. Find the best possible values of a and b.

(b) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition y=1 at x=0, find y for x=0.1 by Euler's method. [7M]

Tal	ole	4
-----	-----	---

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y=f(x):	1.1	1.3	1.6	2.0	2.7	3.4	4.1

(b) Using Runge-Kutta method, solve
$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$$
 with $y(0) = 1$ at $x = 0.2$ and 0.4. [7M]

$\mathbf{UNIT} - \mathbf{III}$

- 5. (a) Evaluate $\int_{0}^{\log 2} \int_{0}^{x} \int_{0}^{x+\log y} e^{x+y+z}$. [7M]
 - (b) Calculate $\int \int r^3 dr d\theta$ over the area included between the circles $r = 2 \sin \theta$ and $r = 4 \sin \theta$. [7M]
- 6. (a) Evaluate $\int_{0}^{1} \int_{e^x}^{e} \frac{1}{\log y} dy dx$ by changing the order of integration. [7M]

(b) Find the area of a plate in the form of a quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. [7M]

$\mathbf{UNIT}-\mathbf{IV}$

- 7. (a) Find the directional derivative of f=xy+yz+zx in the direction of vector i+2j+k at the point (1, 2, 0). [7M]
 - (b) Evaluate $\int_{c} (2x^2 y^2) dx + (x^2 + y^2) dy$, where C is the boundary of the area enclosed by the x-axis and the Upper-half of the circle $x^2 + y^2 = a^2$. [7M]
- 8. (a) A fluid motion is given by $\overline{v} = (y+z)i + (z+x)j + (x+y)k$. Check the motion is irrotational and hence determine the velocity potential. [7M]
 - (b) Determine $\int \overline{f} \cdot \overline{n} \, ds$ where f=4xi-2y²j+z²k and s is the surface bounding the region $x^2 + y^2 = 4, z = 0.z = 3.$ [7M]

$\mathbf{UNIT}-\mathbf{V}$

- 9. (a) Express the integral $\int_{0}^{\infty} \frac{x^{c}}{e^{x}} dx$ in terms of gamma function. [7M] [7M]
 - (b) Express $j_4(\mathbf{x})$ in terms of $j_0(\mathbf{x})$ and $j_1(\mathbf{x})$. [7M] [7M]
- 10. (a) Solve in series the equation $\frac{d^2y}{dx^2} + xy = 0$ [7M]
 - (b) Derive the generating function for $J_n \mathbf{x}$). [7M]

 $-\circ\circ\bigcirc\circ\circ-$