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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Supplementary) - January, 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) Solve the equation $x \tan x = -1$ by Regulafalsi method between 2.5 and 3. Correct the root to 3 decimals. **[7M]**

   (b) Using suitable central difference formula, find f(35) for the following data **[7M]**

x	20	30	40	50	60
f(x)	512	439	346	243	140

2. (a) Using Regula – Falsi method, find a real root of the equation, $xe^x = Cosx$ that lies between 0.4 and 0.6 (x in radians).Correct the root to three decimals. **[7M]**

   (b) Certain corresponding values of x and $\log_{10}x$ are given below. (300, 2.4771), (304, 2.4829), (305,2.4843)and (307, 2.4871). Find $\log_{10}(301)$ using Lagrange's interpolation.

UNIT – II

3. (a) Fit a law of the form $V = a + \left(\frac{b}{A}\right)$ for the following data and hence compute V when a=12. **[7M]**

V	50	47	46	45	44
A	2	3	4	6	10

   (b) Solve $y' = 2y + 3e^x, y(0) = 0$ To find y(0.1),y(0.2) by Taylor Series method. **[7M]**

4. (a) At a Constant temperature Pressure(P) and a Volume(V) of a gas are corrected by the Relation PV^γ= constant. Find the best fitting equation of this form to the following data and estimate V where P = 4 **[7M]**

P	0.5	1.0	1.5	2.0	2.5	3.0
V	1620	1000	750	620	520	460

   (b) Using Modified Euler's method, solve $y' = \log(x + y), y(1) = 2 \; at \; x = 1.2 \; \& \; 1.4$ **[7M]**

UNIT – III

5. (a) Evaluate $\int^{\pi/2}\int_R$ ydx dy where R is the region enclosed by the parabola $x^2 = y$ and the line y = x + 2 **[7M]**

   (b) Evaluate $\int_0^{\pi^2}\int_0^{a\sin\theta}\int_0^{\frac{a^2-r^2}{a}} r dr d\theta dz$ **[7M]**

6. (a) Find the area bounded by the curves $xy = 2,\ 4y = x^2$ and the line y=4. **[7M]**

   (b) Evaluate $\int_0^{1}\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} xyz\, dy\, dy\, dx$ **[7M]**

UNIT – IV

7. (a) Find the constants 'a' and 'b' so that $\vec{f} = \left(axy + z^3\right) i + \left(3x^2 - z\right) j + \left(bxz^2 - y\right) k$ is irrotational and find ϕ such that $\vec{f} = \nabla\phi$ **[7M]**

   (b) Verify Green's theorem for $\int_c \left(3x^2 - 8y^2\right) dx + (4y - 6xy)\, dy$ where 'C' is the boundary of the region by the curves $y = \sqrt{x}$ and y=x^2. **[7M]**

8. (a) Using divergence theorem evaluate $\iint_S \vec{F}\cdot\hat{n}\, ds$, where $\vec{F} = 4x\,\hat{i} - 2y^2\,\hat{j} + z^2\,\hat{k}$ and is the surface enclosed by $x^2 + y^2 = 4,\ z = 0$ and $z = 3$. **[7M]**

   (b) Using Stokes theorem evaluate $\int_C (\sin z\, dx - \cos x\, dy + \sin y\, dz)$, where C is the boundary of the rectangle $0 \le x \le \pi,\ 0 \le y \le 1,\ z = 3$

   [7M]

UNIT – V

9. (a) Using generating functions for $J_n(x)$, prove the following Jacobi series **[7M]**
   i. $\cos(x\sin\theta) = J_0 + 2J_2\cos 2\theta + 4J_4\cos 4\theta + ...$
   ii. $\sin(x\sin\theta) = 2J_1\sin\theta + 2J_3\sin 3\theta + 2J_5\sin 5\theta............$

   (b) Show that $\int_0^{\infty}\sqrt{y}.e^{-y^2}dy.\int_0^{\infty}\frac{e^{-y^2}}{\sqrt{y}}dy = \frac{\pi}{2\sqrt{2}}$

10. (a) Prove that $2nJ_n(x) = x\left\{J_{n+1}(x) + J_{n-1}(x)\right\}$ **[7M]**

    (b) Use Frobenius method to solve $2x(1-x)y'' + (1-x)y' + 3y = 0$ **[7M]**