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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

[Common for : I Semester (CSE, IT, ECE and EEE) | II Semester (AE, CE and ME)]

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) Use the method of false position to find the fourth root of 32 correct to three decimal places. [7M]
- (b) By using Newton's forward interpolation formula, find the cubic polynomial which takes the following values. [7M]

X	0	1	2	3
Y	1	2	1	10

2. (a) Evaluate a real root of $\cos x + 1 = 3x$ by using Newton Raphson's method. [7M]
- (b) A curve passes through the point (0,18), (1,10), (3,18) and (6,90). Find the slope of the curve at $x=2$. [7M]

UNIT – II

3. (a) Using Taylor series method, find the approximate value of y at $x=0.2$ for the differential equation $y' = 2y + 3e^x$, $y(0) = 0$. [7M]
- (b) Apply the method of least squares find the straight line that best fits the following data. [7M]

X	1	2	3	4	5
Y	14	27	40	55	68

4. (a) Fit a curve of the form $y = a + bx^2$ by the method of least squares for the following data: [7M]

X	1	2.5	3.5	4
Y	3.8	15	26	33

- (b) Find $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of fourth order for the equation, $y' = xy + y^2$, $y(0)=1$. [7M]

UNIT – III

5. (a) By changing the order of integration evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dy dx$. [7M]
- (b) Using triple integration find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. [7M]
6. (a) By changing order of integration evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dx dy = \frac{\pi a}{4}$. [7M]
- (b) Using double integration, compute the area common to $x^2+y^2-4y=0$ and $x^2+y^2-4x-4y+4=0$. [7M]

UNIT – IV

7. (a) Find divergence and curl of $\vec{f} = \text{grad} (x^3 + y^3 + z^3 - 3xyz)$. [7M]
- (b) Evaluate $\iint_S \vec{f} \cdot \hat{n} ds$ where $\vec{f} = i - j + xyzk$ and S is the circular region bounded by cutting the sphere $x^2 + y^2 + z^2 = a^2$ with the plane $y=x$. [7M]
8. (a) Prove that if \vec{r} is a position vector of any point in space then $r^n \vec{r}$ is irrotational. [7M]
- (b) Evaluate by Green's theorem $\oint (y - \sin x) dx + (\cos x) dy$ where C is the triangle enclosed by the lines $y = 0$, $x = \frac{\pi}{2}$, $\pi y = 2x$. [7M]

UNIT – V

9. (a) Prove that [7M]
- i. $\Gamma(n+1) = n\Gamma(n)$.
- ii. $\Gamma(n+1) = n!$.
- (b) Obtain the Series Solution of $\frac{d^2y}{dx^2} + xy = 0$ [7M]
10. (a) Solve the differential equation $y'' + \frac{y'}{x} + (8 - \frac{1}{x^2}) y = 0$. [7M]
- (b) Show that $J_0^2 + 2J_1^2 + 2J_2^2 + 2J_3^2 + \dots = 1$. [7M]