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MLR INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

I B.Tech I Semester Regular Examinations, December-2016

COMPUTATIONAL METHODS AND INTEGRAL CALCULUS

(Common to CSE, AERO & IT)

Note: 1.This question paper contains two parts A and B

2. Part A is compulsory which carries 25 marks. Answer all questions in Part A
3. Part B contains of 5 units. Answer any one full question from each unit. Each question carries 10 Marks and may have a, b, c sub questions.

PART-A

1. a) Explain False position method, to find the root of the equation $f(x)=0$ (**2M**)

   b) Evaluate $\Delta^{10}[(1-x)(1-3x^2)(1-5x^3)(1-7x^4)]$ with h =1 (**2M**)

   c) Find the value of $\int_1^4 \frac{1}{x}dx$ by using Trapezoidal rule with h = 1. (**2M**)

   d)Evaluate $\int_0^2\int_0^3 y\,dy\,dx.$ (**2M**)

   e) Show that $\bar{F}=(e^x z-2xy)\bar{i}-(x^2-1)\bar{j}+(e^x+z)\bar{k}$ is conservative. (**2M**)

2. a) Write the Iterative scheme to find square root of N by Newton Raphson method (**3M**)

   b) Construct the Backward difference table (**3M**)

X	1	2	3	4
F(x)	1	4	27	35

   c) Calculate $y_1, if\ y_0=2, y_0'=0, y_0''=2, y_0'''=0, y_0''''=6$ by Taylor's series formula with h = 0.2 (**3M**)

   d) Show that $B(m,n)=B(n,m)$ (**3M**)

   e) Find unit normal vector to the surface $x^2+y^2+2z^2=26$ at the point $(2,2,3)$ (**3M**)

PART-B

3. a) Using Newton – Raphson method, find the root of the equation $f(x)=e^x-3x$ which lies between 0 and 1. (**5M**)

   b) Apply Gauss Seidel method to solve the system of equations

   $8x-3y+2z=20, 4x+11y-z=33, 6x+3y+12z=36.$ (**5M**)

OR

4. a) By using Bisection method, find the root of the equation $x^3-x-11=0$. (**5M**)

   b) Solve the system of equations $20x+y-2z=17, 3x+20y-z=-18, 2x-3y+20z=25$ by Gauss Jacobi method (**5M**)

5. a) Use Lagrange's interpolation formula to find $y(10)$ (**5M**)

x	5	6	9	11
y	12	13	14	16

b) Fit a second degree polynomial to the following data by the method of least squares (**5M**)

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

OR

6. a) Given $\sin 45^o = 0.7071, \sin 50^o = 0.766, \sin 55^o = 0.8192, and\ \sin 60^o = 0.866$. Find $\sin 52^o$ using Newton's forward interpolation formula. (**5M**)

b) Fit a straight line to the following data by the method of least squares (**5M**)

x	5	10	15	20	25
y	15	19	23	26	30

7. a) Apply Simpson's 1/3 rule to estimate an approximate value of $\int_1^2 \frac{e^x}{x}\,dx$, by taking n = 4. (**5M**)

b) Use Runge – Kutta fourth order method to solve the initial value problem $\frac{dy}{dx} = y - x,\ y(0) = 2$ and find $y(0.1)$. (**5M**)

OR

8. a) Solve $y' = y + x,\ y(0) = 1$ by using Picard's method and hence find y(0.1) (**5M**)

b) Applying, Simpson's 3/8 rule estimate an approximate value of the integral $\int_0^6 \frac{dx}{1+x}$. (**5M**)

9. a) Evaluate $\iint_R (4xy - y^2)dxdy$, where R is the rectangle bounded by $x = 1, x = 2, y = 0, y = 3$. (**5M**)

b) Evaluate $\int_0^{\frac{\pi}{2}} \sin^4\theta \cos^5\theta d\theta$ (**5M**)

OR

10. a) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dzdydx$ (**5M**)

b) Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$ (**5M**)

11. a) If $\bar{a} = (3x^2y - z)\bar{i} + (xz^3 + y^4)\bar{j} - 2x^3z^2\bar{k}$ find $grad(div\bar{a})$ at (2,-1,0) (**5M**)

b) Find $\int_C \vec{F} \bullet d\bar{r}$ *where* $\vec{F} = x^2\, y^2\, \vec{i} + y\, \vec{j}$ and the curve $y^2 = 4x$ in xy plane from $(0,0)$ *to* $(4,4)$. (**5M**)

OR

12. a) If $\bar{f} = xy^2\bar{i} + 2x^2yz\bar{j} - 3yz^2\bar{k}$ find *curl* $\bar{f}$, *div* $\bar{f}$ at the point (1, -1, 1). (**5M**)

b) Evaluate by Green's theorem $\int_c (y - \sin x)dx + \cos x\, dy$ where C is the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}, \pi y = 2x$ (**5M**)

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