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## M.C.A. DEGREE EXAMINATION, May 2015 <br> (FIRST SEMESTER)

## 111. NUMERICAL METHODS

Time: Three hours
Maximum: 100 marks

## SECTION -A

$(5 \times 8=40)$

## Answer any FIVE questions

1. Given the following equations $\mathrm{x}^{4}-\mathrm{x}-10=0$, determine the initial approximations to find the smallest positive root. Use these to find the roots correct to their decimal places with the regular-Falsi me thod.
2. Determine the roots correct to two decimals of $x^{3}-x-4=0$ by using bisection method.
3. Solve the equations
$x_{1}+x_{2}+x_{3}=6$
$3 x_{1}+3 x_{2}+4 x_{3}=20$
$2 \mathrm{x}_{1}+\mathrm{x}_{2}+3 \mathrm{x}_{3}=13$
by using Guass elimination method,
4. From the following data calculate the diffe rence and obtain the forward difference polynomials. Interpolase at $x=0.25$

| $x$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}(\mathrm{x})$ | 1.40 | 1.56 | 1.76 | 2.0 | 2.28 |

5. 

Evaluate $\int_{0}^{1} \frac{d x}{1+x^{2}}$ using Simpson's three-eight rule
6. Evaluate $\int_{0}^{1}\left(1+\frac{\sin x}{x}\right) d x$ correct to three decimal places using trapezoidal rule.
7. Solve the initial value problem $y^{\prime}=(\mathrm{t} / \mathrm{y}), \mathrm{y}(0)=1$ by using Euler's method with $\mathrm{h}=0.2$ to get $\mathrm{y}(0.2)$.
8. Given the initial value problem $u^{\prime}=e^{\mathrm{t}}, \mathrm{u}(1)=2$ estimate $\mathrm{u}(1.4)$ with $\mathrm{h}=0.2$ using the fourth order Runge-Kutta method.

## SECTION -B

## Answer any THREE questions

9. a) Employ the Newton-Raphson method to determine a real root for $f(x)=-2.0+6 x-4 x^{2}+0.5 x^{3}$ using initial guesses of (a) 4.2 (b) 4.43
b) Derive Newton Raphson method.

## 7256

10. Solve by using (a) Guass- Jordan and (b) Guass-Seidel method the system of equation $\quad 2 x_{1}+x_{2}-x_{3}=1$

$$
5 x_{1}+2 x_{2}+2 x_{3}=-4
$$

$$
3 x_{1}+x_{2}+x_{3}=5
$$

11. Find the unique polynomial $P(x)$ of degree 2 or less such that $P(1)=1, P(3)=27$, $P(4)=64$ using the following methods (a) Lagrange interpolarity formula (b) Newton divided difference formula.
12. The following data for the function $f(x)=x^{4}$ is given

| X | 0.4 | 0.6 | 0.8 |
| :--- | :--- | :--- | :--- |
| $\mathrm{f}(\mathrm{x})$ | 0.0256 | 0.1296 | 0.4096 |

Find f ' $(0.8)$ and $\mathrm{f} "(0.8)$ using quadratic interpolation. Compare with exact solution. Obtain the bound on the truncation errors.
13. Use Hues method to integrate $y^{\prime}=4 e^{0.8 x}-0.5 y$ from $x=0$ to $x=4$ with a step size of 1 the initial condition at $\mathrm{x}=0$ is $\mathrm{y}=2$.

