Reg. No..... (Pages : 2) **L 5540**

Name.....

# FOURTH SEMESTER M.C.A. DEGREE EXAMINATION NOVEMBER/DECEMBER 2004

## NUMERICAL METHODS

Time : Three Hours Maximum : 75 Marks

### Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What is meant by the method of least square ? Illustrate with an example.
2. State the equation to represent an exponential curve.
3. What is a transcendental equation ? Give *two* examples.
4. Write the program segment in C to evaluate

$$Y = Y_1 + (x - x_1)\frac{(y_2 - y_1)}{(x_2 - x_1)}.$$

5. Write a program in C to obtain the difference table using 4 arguments and their entries.
6. State the Stirling's formula for interpolation and specify the meaning of the terms used.
7. Illustrate how the derivative of a function $y = f(x)$ with respect to $x$ can be obtained from Newton's Forward difference formula.
8. State Simpson's $\frac{1}{3}$ rule for integration of $f(x)$ and write down the expression in C programming language when $f(x) = \frac{1}{1+x}$.
9. Briefly explain Euler's method to solve ordinary differential equation.
10. State how loops are generated in programming with C language.

(10 × 3 = 30 marks)

### Part B

*Answer* **six** *questions, taking not more than* **two** *questions from each unit.*
*Each question carries 7½ marks.*

UNIT I

11. The table below gives the temperature T (in °C.) and length $l$ (in mm.) of a heated rod. If $l = a_0 + a_1 T$, find the best estimates of $a_0$ and $a_1$.

| T | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|
| L | 800·3 | 800·4 | 800·6 | 800·7 | 800·9 | 801·0 |

**Turn over**

12. Find a real root of the equation $x^3 - 2x - 5 = 0$ using bisection method.

13. Solve the following system of equations using Gauss-Jordan method :—

$$\begin{aligned} 2x + y + z &= 10 \\ 3x + 2y + 3z &= 18 \\ x + 4y + 9z &= 16. \end{aligned}$$

## Unit II

14. The table below gives the values of tan $(x)$ for selected values of $x$. Find tan (0·12) :

| $x$ | 0·10 | 0·15 | 0·20 | 0·25 | 0·30 |
|---|---|---|---|---|---|
| $y = \tan(x)$ | 0·1003 | 0·1511 | 0·2027 | 0·2553 | 0·3073 |

15. From the following table find the value of $e^{1.17}$ using Gauss forward formula :—

| $x$ | 1·0 | 1·05 | 1·10 | 1·15 | 1·20 | 1·25 | 1·30 |
|---|---|---|---|---|---|---|---|
| $e^x$ | 2·7183 | 2·8577 | 3·0042 | 3·1582 | 3·3201 | 3·4903 | 3·6693 |

16. Suppose for $x = 2, f(2) = 0{\cdot}69315$ ; $x = 2{\cdot}5, f(2{\cdot}5) = 0{\cdot}91629$ and for $x = 3, f(3) = 1{\cdot}09861$. Find the value of $x$ for which $f(x) = 0{\cdot}98261$.

## Unit III

17. The following table gives the angular displacements θ (radians) at different intervals of time $t$ (seconds) :—

| θ | 0·052 | 0·105 | 0·168 | 0·242 | 0·327 | 0·408 | 0·489 |
|---|---|---|---|---|---|---|---|
| $t$ | 0 | 0·02 | 0·04 | 0·06 | 0·08 | 0·10 | 0·12 |

Calculate the angular velocity at $t = 0{\cdot}06$.

18. Evaluate $\int_1^3 \frac{1}{x}\,dx$ by Simpson's rule using 9 arguments correct to 5 decimals.

19. Solve the equation $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$ using Picard's successive approximation.

(6 × 7½ = 45 marks)