

Subject Code—4215

M.C.A. (Third Year) EXAMINATION

(5 Years Integrated Course)

MATHEMATICS— III

MCA-305

Computer Oriented Numerical and Statistical
Methods Using C

Time : 3 Hours

Maximum Marks : 100

*Note : Attempt any Five questions. All questions
carry equal marks.*

1. (a) Describe floating point representation of numbers.
- (b) (i) Multiply the numbers $0.200000E4$
and $0.400000E-2$.
- (ii) Divide the numbers $0.876543E-5$
by $0.200000E-3$.

P.T.O.

$$4215 = \frac{1}{6}$$

(c) Define absolute and relative errors. A civil engineer has measured the height of a 10 floor building as 2950 cm and the working height of each beam as 35 cm while the true values are 2945 cm and 30 cm, respectively. Compare their absolute and relative errors.

2. (a) Find the root of the equation

$$f(x) = x^2 - 3x + 2$$

in the vicinity of $x = 0$ using Newton-Raphson method.

(b) Find the root of the equation :

$$xe^x = \cos x$$

using the Regula-Falsi method correct to four decimal places.

3. (a) Solve the equations :

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$x_1 + x_2 + 2x_3 - 10x_4 = 9$$

by Gauss-Seidal iteration method.

(b) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$, taking $h = 0.2$.

4. (a) What are predictor-corrector methods? Explain Milne's method for solving ordinary differential equations.

(b) Find the first and second derivatives of the function tabulated below, at $x = 1.5$:

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.0	13.625	24.0	38.875	59.0

5. (a) Evaluate :

$$\int_0^1 \frac{dx}{1+x^2}$$

using :

(i) Trapezoidal rule taking $h = 0.2$

(ii) Simpson's $\frac{1}{3}$ rd rule taking $h = 0.25$

(iii) Simpson's $\frac{3}{8}$ rd rule taking $h = \frac{1}{6}$

Hence compute an approximate value of π in each case.

$$4215 = \frac{3}{6}$$

(b) Find the cubic polynomial which takes the following values :

$$x : 0 \quad 1 \quad 2 \quad 3$$

$$f(x) : 1 \quad 2 \quad 1 \quad 10$$

Hence or otherwise evaluate $f(4)$.

6. (a) Use Bessel's formula to find the value of y if $x = 3.75$, given :

$$x : 2.5 \quad 3.0 \quad 3.5 \quad 4.0 \quad 4.5 \quad 5.0$$

$$y : 21.143 \quad 22.043 \quad 20.221 \quad 18.644 \quad 17.262 \quad 16.047$$

(b) The following table gives the values of x and y :

$$x : 1.2 \quad 2.1 \quad 2.8 \quad 4.1 \quad 4.9 \quad 6.2$$

$$y : 4.2 \quad 6.8 \quad 9.8 \quad 13.4 \quad 15.5 \quad 19.6$$

Using Lagrange's method for inverse interpolation find the value of x corresponding to $y = 12$.

7. (a) Fit a second order polynomial to the data in the table below :

$$x : 1.0 \quad 2.0 \quad 3.0 \quad 4.0$$

$$y : 6.0 \quad 11.0 \quad 18.0 \quad 27.0$$

$$4215 = \frac{4}{6}$$

(b) A die is thrown 264 times with the following results :

No. appeared on the die	Frequency
1	40
2	32
3	28
4	58
5	54
6	60

Show that the die is biased.

(Given χ^2 for 5 d.f. at 5% level = 11.07)

8. (a) Explain what do you understand by "Analysis of Variance". Perform a two-way ANOVA on the data given below :

Plots of land	Treatment			
	A	B	C	D
I	38	40	41	39
II	45	42	49	36
III	40	38	42	42

(Use coding method subtracting 40 from the given numbers). Given for (3, 6) d.f., $F_{0.05} = 4.76$ and for (2, 6) d.f. $F_{0.05} = 5.14$.