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(5th Semester)

MATHEMATICS

Paper : MATH–351

(Computer-oriented Numerical Analysis)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Define factorial polynomial. Express $f(x)\ \ x^3\ \ 3x^2\ \ 5x\ \ 7$ in terms of factorial polynomial taking $h\ \ 2$ and find its differences. 1+3+1=5

(b) Express any value of y in terms of y_n and the backward differences of y_n. Find the value of $y(\ \ 1)$ if $y(0)\ \ 2$, $y(1)\ \ 9$, $y(2)\ \ 28$, $y(3)\ \ 65$, $y(4)\ \ 126$ and $y(5)\ \ 217$. 2+3=5

2. *(a)* Find a real root of the equation $e^x\ \ 3x\ \ 0$ correct up to four decimal places by the method of successive iteration. 5

(b) Find the positive real roots of the equation $x\log_{10} x\ \ 1\ 2\ \ 0$ by regula-falsi method. 5

UNIT—II

3. *(a)* Obtain Newton's backward interpolation formula with equal intervals of the argument. 6

(b) Find a polynomial of degree four which takes the values : 4

x	2	4	6	8	10
y	0	0	1	0	0

4. *(a)* Obtain Lagrange's interpolation formula for unequal intervals. 6

(b) Using Newton's divided difference formula, find the values of $f(2)$ and $f(8)$ from the following table : 4

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

UNIT—III

5. *(a)* Solve the following system of equations by Gaussian elimination method : 5

$$x \quad 2y \quad z \quad 3$$
$$2x \quad 3y \quad 3z \quad 10$$
$$3x \quad y \quad 2z \quad 13$$

(b) Explain the difference between Gauss elimination and Gauss-Jordan elimination methods. Write an algorithm for Gauss-Jordan elimination method. 2+3=5

6. *(a)* Solve, by Gauss-Seidel method, the following system of equations: 4

$$2x \quad y \quad 3$$
$$2x \quad 3y \quad 5$$

(b) By Routh's method, solve the following system of simultaneous equations : 6

$$x \quad y \quad z \quad 3$$
$$2x \quad y \quad 3z \quad 16$$
$$3x \quad y \quad z \quad 3$$

UNIT—IV

7. *(a)* Using Newton's forward difference interpolation formula, find the derivatives of $y \quad f(x)$ passing through $n \quad 1$ points up to third-order derivatives. 5

(b) Evaluate

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

using trapezoidal rule with $h \quad 0\,2$. Hence, obtain an approximate value of . 5

8. *(a)* Find the first two derivatives of $y \quad x^{1/3}$ at $x \quad 50$ and $x \quad 56$ from the following table : 5

x	50	51	52	53	54	55	56
$y \quad \sqrt[3]{x}$	3·6840	3·7084	3·7325	3·7563	3·7798	3·8030	3·8259

(b) Evaluate

$$\int_0^{/2} \sqrt{\sin} \; d$$

using Simpson's one-third rule taking ten equal intervals. 5

UNIT—V

9. *(a)* Using Taylor series method, find the values of $y(1 \quad 1)$ and $y(1 \quad 2)$ correct up to four decimal places given below : 5

$$\frac{dy}{dx} \quad xy^{1/3}, \; y(1) \quad 1$$

(b) Solve

$$\frac{dy}{dx} \quad x \quad y$$

given $y(0) \quad 1$. Obtain the values of $y(0 \;\; 1)$ and $y(0 \;\; 2)$ using Picard's method. 5

10. *(a)* Solve the differential equation

$$\frac{dy}{dx} \quad 1 \quad y$$

given $y(0) \quad 0$. Using modified Euler's method, find $y(0 \;\; 1)$ and $y(0 \;\; 2)$. 4

(b) Apply the fourth-order Runge-Kutta method to find $y(0 \;\; 3)$, given that

$$\frac{dy}{dx} \quad y \quad xy^2 \quad 0, \; y(0) \quad 1$$

by taking $h \quad 0 \;\; 1$ (correct up to four decimal places). 6

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Subject Code : MATH/V/05

Booklet No. A

Date Stamp ....

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To be filled in by the Candidate

DEGREE 5th Semester
(Arts / Science / Commerce / ....) Exam., **2017**

Subject ....

Paper ....

To be filled in by the Candidate

DEGREE 5th Semester
(Arts / Science / Commerce / ....) Exam., **2017**

Roll No. ....

Regn. No. ....

Subject ....

Paper ....

Descriptive Type

Booklet No. B ....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

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MATH/V/05

2 0 1 7

(5th Semester)

MATHEMATICS

Paper : MATH–351

(Computer-oriented Numerical Analysis)

(PART : A—OBJECTIVE)

(*Marks* : 25)

SECTION—A

(*Marks* : 10)

Each question carries 1 mark

Put a Tick ☑ mark against the correct answer in the box provided :

1. Which of the following relations is true?

(a) $E \quad 1$ ☐

(b) $E \quad 1$ ☐

(c) $E \quad 1$ ☐

(d) $E \quad 1$ ☐

2. A polynomial of odd degree with real coefficients always has

(a) at least no real roots ☐

(b) at least one real root ☐

(c) at least two real roots ☐

(d) at least one real root and one imaginary root ☐

3. A forward difference table contains n arguments, then the highest-order differences in the table is

(a) $n \quad 1$ ☐

(b) n ☐

(c) $n \quad 1$ ☐

(d) None of the above ☐

4. Lagrange's interpolation polynomial for the data $f(0) \quad 0$, $f(1) \quad 0$ and $f(3) \quad 6$ is

(a) $(x \quad 1)(x \quad 1)$ ☐

(b) $x^2 \quad 1$ ☐

(c) $x(x \quad 1)$ ☐

(d) $x(x \quad 1)$ ☐

5. If A is the coefficient matrix obtained from a system of simultaneous equations, then the system has a single and unique solution if and only if the determinant of A is

(a) equal to zero ☐

(b) not equal to zero ☐

(c) greater than zero ☐

(d) smaller than zero ☐

6. Gauss-Jordan elimination method reduces the coefficient matrix of the simultaneous equations into

(a) column matrix ☐

(b) lower triangular matrix ☐

(c) upper triangular matrix ☐

(d) identity matrix ☐

7. If $f(3)$ 0, $f(4)$ 2 and $f(5)$ 6, then f (3) is equal to

(a) 0 ☐

(b) 1 ☐

(c) 2 ☐

(d) 3 ☐

8. The value of

$$\int_{/6}^{/3} \sin x \, dx$$

using trapezoidal rule by taking $h \quad \frac{}{6}$ is

(a) $\frac{1 \quad \sqrt{3}}{24}$ ☐

(b) $\frac{1 \quad \sqrt{3}}{12}$ ☐

(c) $\frac{(1 \quad \sqrt{3})}{24}$ ☐

(d) $\frac{(1 \quad \sqrt{3})}{12}$ ☐

9. Given $y \quad y^2$ and $y(0) \quad 1$. The value of y at $x \quad 1$ taking $h \quad 1$ using Euler's method is

(a) 0 ☐

(b) –2 ☐

(c) 1 ☐

(d) 2 ☐

10. The Runge-Kutta method of second order is exactly similar to

(a) Picard's method ☐

(b) modified Euler's method ☐

(c) Euler's method ☐

(d) Taylor series method ☐

SECTION—B

(*Marks* : 15)

Each question carries 3 marks

1. Establish the relation between operators E and .

2. Construct the divided difference table of $f(x) \quad x^3 \quad x \quad 2$ for the arguments 1, 3, 6, 11.

3. Solve the given equations by Gauss-Jordan method :

$$2x \quad y \quad 3$$
$$7x \quad 3y \quad 4$$

4. Evaluate

$$\int_1^3 x^4 \, dx$$

using Simpson's one-third rule by dividing the range into four equal intervals.

5. Using Milne's method, find $y(4 \;\; 4)$, given $5xy \quad y^2 \quad 2 \quad 0$,
$y_1 \quad 0 \;\; 0493$, $y_2 \quad 0 \;\; 0467$ and $y_3 \quad 0 \;\; 0452$.

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