NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-language or in C-language.

Set—I

1. Write a program to find the area and circumference of a circle whose diameter is given. Demonstrate your program for the diameters 1034·78 and 14445·44.

2. Write a program to find the roots of a quadratic equation $ax^2 + bx + c = 0$. Demonstrate your program for the equation $4{\cdot}12456x^2 - 412{\cdot}2256x - 12332234{\cdot}913 = 0$.

3. Write a program to find the G.C.D. between two integers. Demonstrate your program for the numbers 310213 and 18972.

4. Write a program to subtract the matrix A from the matrix 4.5A.

5. Write a program to subtract a matrix B from the matrix A.

6. Write a program which will convert uppercase characters of a string to lowercase characters. Demonstrate your program for the string '1901.Rabindra Nath Sarkar'.

7. Write a program to sort a group of names in descending order. Demonstrate your program for the set of strings Gopal, Krishna, Kanai, Surya, Barun, Pati.

8. Write a program to rewrite name of a person in short form (e.g. Janaki Ranjan Sarkar in the form J.R.Sarkar).

9. Write a program to find the mean and standard deviation of a set of 10 numbers. Demonstrate your program for the numbers 3·214, 1·82, 9·08, 12·356, 22·323, 4·532, 1·230, 43·21, 20123·0 .

10. Write a program to find a root of the equation $(x - 1{\cdot}5)(x - 2{\cdot}5)(x - 3{\cdot}5)(x - 4{\cdot}5) = 0$ by bisection method, correct up to 5 decimal places starting from $x = 1{\cdot}0$.

11. Write a program to find a real root near $x = 1$ of the equation $x^{50} - 1 = 0$ using Regula-falsi method correct up to 4 decimal places.

12. Write a program to evaluate $\int_{1.4}^{2.2} \left(2\log x + x^3\right) dx$ by Simpson $\frac{1}{3}$rd rule taking 100 subintervals.

13. Write a program to find the value of $y(0{\cdot}2)$ from the differential equation :
$\frac{dy}{dx} = x + y^2 + 1{\cdot}03$, $x(0{\cdot}05) = 1$ by fourth order Runge-Kutta methods.

———

NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-language or in C-language.

Set—II

1. Write a program to test whether a matrix is symmetric or skew-symmetric.
2. Write a program to determine whether a matrix of order 3×3 is singular or not.
3. Write a program to check a string for palindrome without using library function.
4. Write a program which will convert lowercase characters of a string to uppercase characters.
5. Write a program to find the second and third central moments for the sample 345.21, 567.98, 298.09, 123.54, 349.10, 908.23, 342.33.
6. Write a program to compute the value of sine series upto 15 and 20 terms and compare the result when $x = 0.75$.
7. Write a program to find the value of n! for n = 5, 8, 15, 20 and 26.

8. Write a program to find the values of ${}^{n}C_{r}$ for given values of n and r. Demonstrate your program for n = 10, r = 4.

9. Write a program to a test whether a positive integer is prime number or not. Demonstrate your program for the integers 2, 12, 153, 34577.

10. Write a program to evaluate $\int_{0}^{1} x + e^{2x}\, dx$ by Simpson $\frac{1}{3}$rd rule taking 50 subintervals.

11. Write a program to find a real root near x = 1 of the equation $x^{30} - 1 = 0$ using Regula-falsi method correct up to 4 decimal places.

12. Write a program to find a root of x = cos x by bisection method, correct up to 5 decimal places.

13. Write a program to find a real root of the equation $3x^5 - 10x^4 - 4x^2 + 2x + 8 = 0$ by Newton-Raphson method correct up to 5 decimal places.

14. Write a program to find the value of y(0.1) from the differential equation :

$\frac{dy}{dx} = x + 2y + 10$, x(0) = 1.1 by second order Runge-Kutta methods.

15. Write a program to find the sum of the series :

$1 + \frac{1}{(2\times5)^2} + \frac{1}{(2\times5)^4} + \frac{1}{(2\times5)^6} \cdots$ correct upto 5 decimal places.

---

6. Write a program to evaluate $\int_0^1 \left(x^2 + \alpha \cos x\right) dx$ by Simpson $\frac{1}{3}$rd rule taking h = 0·1 and α is your class roll number.

7. Write a program to find the value of y(0·2) from the differential equation :
$\frac{dy}{dx} = x^2 + y$, x(0·1) = 1 by second order Runge-Kutta methods.

8. Write a program to find the sum of the series :
$x + \frac{x^2}{2 \cdot 3} + \frac{x^3}{3 \cdot 4} + \frac{x^4}{4 \cdot 5} + \cdots + \frac{x^n}{n \cdot (n+1)}$ for n = 20 and x = 1·3.

9. Write a program to test the orthogonality of a matrix.

10. Write a program to find the sum of all elements of a matrix and the trace of the same matrix.

11. Write a program to find the length (i.e. the number of characters including blank spaces) of a string. Demonstrate your program for the string 'I am very strong in Computer Programming'.

12. Write a program to search a sub-string within a string. Using your program find the occurrences of the substring 'th' within the string 'What is the name of this college ?'

13. Write a program to find a real root of the equation $x^5 - 3x^3 + 10x - 14 = 0$ using Newton-Raphson method, correct up to 5 decimal places.

NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-*l*anguage or in C-*l*anguage.

Set—III

1. Write a program to evaluate $\int_{1.5}^{2} (x \log x + \sin x)dx$ by trapezoidal rule taking 120 subintervals.

2. Write a program to find all the numbers between 1 and N that are divisible by 7 and 20.

3. The terms of the Fibonacci series is defined as :

   F(0) = 1

   F(1) = 1

   F(n + 2) = F(n) + F(n + 1), n = 0, 1, 2, ...

   Write a program to find the first 50 Fibonacci numbers.

4. Write a program to find all the prime numbers between 100 and 200.

5. Write a program to find the L.C.M. between two integers. Demonstrate your program for the integers 12001 and 35544.

NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-language or in C-language.

Set—IV

1. Write a program to check a string for palindrome without using library function. Demonstrate your program for the strings 'madam' and 'vidya'.

2. Write a program to convert binary number to a decimal number. Demonstrate your program for 110011001000.

3. Write a program to find the sum of the series :
$1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\cdots\cdots+\frac{1}{n}$ for given n = 13.

4. Write a program for the product of two matrices, of order m × n and n × p.

5. Write a program to find a root of the equation $x^2 - 2x^2 + x = 3$ by Regula-falsi method, correct up to 5 decimal places.

6. Write a program to find the second and third central moments of a set of 8 numbers. Demonstrate your program for the sample 8, 9, –8, 5, 6, 12, 34, 76.

7. Write a program to find the number of words in a string.

8. Write a program to find the L.C.M. between two integers. Demonstrate your program for the integers 28, 46.

9. Write a program to find the sum of the series :

   $1 + x/2! + x^2/3! + x^3/4! + \ldots\ldots\ldots\ldots\ldots$

   Correct up to 5 decimal places for $x = 1{\cdot}3$.

10. Write a program to find the transpose of a matrix order $m \times n$.

11. Write a program to find the maximum and minimum numbers from a given set of real numbers. Also find the product of them.

12. Write a program to evaluate $\int_1^2 x^3 \sin x \, dx$ by trapezoidal rule taking 100 subintervals.

13. Write a program to solve the equation $\frac{dy}{dx} = y^2 - x^2 + 2$, $y(0) = 2$ by second order Runge-Kutta method for $x = 0{\cdot}1$.

14. Write a program to find a real root of the equation $x^3 + x - 1 = 0$ by fixed point Iteration method correct upto 5 decimal places.

15. Write a program which will convert lowercase characters of a string to uppercase characters. Demonstrate a program for the string 'Weight of an Apple is 123.56 gm'.

16. Write a program to evaluate $\int_0^1 x^2 \, dx$ by Simpson's $\frac{1}{3}$ rule taking 100 subintervals.

17. Write a program to solve the equation $\frac{dy}{dx} = y^2 - x^2$, $y(0) = 0$ by second order Modified Euler's method for $x = 0.1$.

NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-language or in C-language.

Set—VI

1. Write a program to find the sum of the series :
   $r\cos x + r^2\cos 2x + r^3\cos 3x + \cdots$
   Correct upto 5 decimal places for $x = 1.5$, $r = 0.5$.
2. Write a sub-program to find the value of $\underline{|n}$. Use it to find ${}^nc_r$, ${}^np_r$ for $n = 10$, $r = 5$.
3. Write a program to find sum of all integers divisible by 7 between two integers.
4. Write a program to find $A + A^T$ for a square matrix A of order n.
5. Write a program to determine whether a matrix of order 3×3 is singular or not.
6. Write a program to check a string for palindrome without using Library function.
7. Write a program to find skewness for a sample of size n. Use it for the following data set :
   5 7 10 13 17 20 33 35 41 47

8. Write a program to evaluate $\int_1^2 \left(x \log x + e^x\right) dx$ by Simpson's $\frac{1}{3}$rd rule taking 100 subintervals.

9. Write a program to find a real root of the equation $x - \tan 2(x - 1) = 0$ correct to 5 decimal places using Regula-falsi method.

10. Write a program to find a real root of the equation $x^2 = \sin x$ correct to 6 significant figures by iteration method.

11. Write a program to sort n names alphabetically.

12. Write a program to find the value of y(0·2) from the differential equation

$$\frac{dy}{dx} = x^2 + y^2 + 100, \quad x(0) = 1.25$$

by Second order Runge-Kutta method.

13. Write a program to find the sum of the series :

$$\frac{1}{\lfloor 2} + \frac{1}{\lfloor 2.\lfloor 3} + \frac{1}{\lfloor 3.\lfloor 4} + \frac{1}{\lfloor 4.\lfloor 5} + \cdots$$

Correct upto 5 decimal places.

14. Write a program to solve the following system of linear equations by Gauss-Seidal iteration method correct to five decimal places :

$$\begin{aligned} 9x_1 + 2x_2 + x_3 - x_4 &= 0.5 \\ 2x_1 + 9x_2 + x_4 - x_3 &= 0.7 \\ x_1 + x_2 + 9x_3 + 2x_4 &= 0.9 \\ x_1 - x_2 + 2x_3 + 9x_4 &= 0.3 \end{aligned}$$

NEW

Part–III 3-Tier

2015

MATHEMATICS

(Honours)

PAPER—VIII

(PRACTICAL)

Full Marks : 30

(PROBLEM – 24 + PNB & VIVA – 6)

TIME — 2 HOURS

Group—C

Answer *two* questions : 2×12

The questions must be allotted by Lottery.

Program must be written either in FORTRAN-language or in C-language.

Set—V

1. Write a program to find the sum of the series :

$$\frac{x^2}{(1+x^2)} - \frac{x^4}{2^2(1+x^4)} + \frac{x^6}{2^3(1+x^6)} - \frac{x^8}{2^4(1+x^8)} + \cdots$$

Correct upto five decimal places for $x = 1.5, 2.5, 3.5$.

2. Write a program to convert a decimal number to binary number.

3. Write a program to reverse an integer. Also find difference between original number and reverse one.

4. Write a program to find product of two matrices of order $m \times n$ and $n \times p$.

5. Write a program to find a root of the equation $e^x - e^{-x} - 4x = 0$ by Regula-falsi method correct upto five decimal places.

6. Write a program to find correlation coefficient for a bivariate data of size n. Apply it for the following set of data :

x	:	3	5	7	– 4	14	– 13	15	– 16	17	10
y	:	– 9	10	– 11	12	– 13	14	– 15	16	– 17	18

7. Write a program to read a string and print its different words in different lines.

8. Write a program to find difference between L.C.M. and G.C.D. for two integers.

9. Write a program to find transpose of a square matrix then find its difference from original matrix.

10. Write a program to sort a set of n numbers and then find maximum and minimum among them.

11. Write a program to evaluate $\int_1^5 \log_{10} x \, dx$ by trapezoidal rule taking 100 subintervals.

12. Write a program to check a string for palindrome without using library function.

13. Write a program to solve the equation $\frac{dy}{dx} = x^2 + y^2 + e^{xy}$, $y(0) = 2$ by second order Runge-Kutta method for $x = 1$.

14. Write a program which will convert upper case characters of a string to lowercase characters. Demonstrate your program for the string 'My Roll Number is F350'.

2015

MATHEMATICS

[Honours]

PAPER – VIII

Full Marks : 60

Time : 3 hours

The figures in the right hand margin indicate marks

GROUP – A

(*Numerical Analysis*)

[*Marks* : 25]

1. Answer any *two* questions : 8 × 2

(*a*) (*i*) Describe Regula-Falsi method for computing a simple real root of an equation $f(x) = 0$ and give its geometric interpretation. 4

(*ii*) Show that the iteration method is linearly convergent. How the rate of convergence of this method can be accelerated ? 4

(*b*) (*i*) If a number is correct to n significant figures and the first significant digit of number is k, then show that the relative error is less than $\frac{1}{\left(k \times 10^{n-1}\right)}$. 4

(*ii*) If Lagrange's interpolation formula for the function $y = f(x)$ can be written in the form

$$\phi(x) = \sum_{r=0}^{n} \frac{F(x) f(x_r)}{(x - x_r) F'(x_r)}$$

where $F(x) = (x - x_0)(x - x_1)...(x - x_n)$ then show that

$$\sum_{r=0}^{n} \frac{F(x)}{(x - x_r) F'(x_r)} = 1. \quad 4$$

(*c*) Obtain the composite form of Simpson's one-third rule. Show that Simpson's one-third rule gives exact results if applied to a polynomial of degree three. Derive the error term in trapezoidal rule. 3 + 3 + 2

2. Answer any *two* questions : 4 × 2

(*a*) Prove that

$$f(x_k, x_{k-1}, ..., x_{k-n}) = \frac{\nabla^n f(x_k)}{n!\, h^n},$$

where the arguments are equispaced and ∇ being a backward difference operator. Hence show that

$$f(x_n, x_{n-1}, ..., x_0) = \frac{\nabla^n f(x_n)}{n!\, h^n}.$$ 4

(*b*) Determine the value of y when $x = 0{\cdot}1$ given that $y(0) = 1$ and $\frac{dy}{dx} = x^2 + y$ using modified Euler's method. 4

(*c*) Solve the following system using Gauss elimination method : 4

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

3. Answer any *one* question : 1×1

(*a*) State a sufficient condition for convergence of the Gauss-Seidal method. 1

(*b*) Define 'degree of precision' of a numerical integration formula. 1

GROUP – B

(*Elements of Computer Science*)

[*Marks* : 35]

4. Answer any *one* question : 15×1

(*a*) (*i*) Draw a flowchart for finding the sum of the series

$$\frac{x}{\lfloor 1} - \frac{x^3}{\lfloor 3} + \frac{x^5}{\lfloor 5} \cdots\cdots$$

for a given value of x such that $-1 \leq x \leq 1$. 5

(*ii*) Write a program to compute one positive real root of $x^3 - 3x - 5 = 0$ by the Newton-Raphson method with the initial

approximation $x_0 = 2$. The iterations should be terminated when $|x_{i+1} - x_i| \leq 10^{-5}$ or $i = 10$ whichever is earlier. 5

(*iii*) What do you mean by positional number system ? Calculate the following sum and subtraction : 5

110111.11 + 11011101.0101
110000 – 100111

(*b*) (*i*) Write a program to determine the following repeated fraction : 5

$$X(20) + \cfrac{1}{X(19) + \cfrac{1}{\cdots + \cfrac{1}{X(2) + \cfrac{1}{X(1)}}}}$$

(*ii*) Write an algorithm to calculate the first *n* Fibonacci numbers. 5

(*iii*) Explain different types of 'if' statements with suitable examples. 5

5. Answer any *two* questions : 8×2

(*a*) (*i*) Simplify the following Boolean functions to a minimum number of literals

$xyz + x'y + xyz'$ and $(A + B)'(A' + B')'$ 4

(*ii*) Write an user defined function to check whether a number is prime or not. 4

(*b*) (*i*) Write down the basic feetures of an algorithm. What are the main advantages of flow chart for representing algorithm ? 5

(*ii*) Why are binary numbers used in computer design instead of decimal numbers ? Convert the decimal number 32·75 into binary number. 3

(*c*) (*i*) Differenciate the following :

Source program and object program, compiler and interpreter. 4

(*ii*) Write a program to count the number of vowels in a word. 4

6. Answer any *one* question : 4×1

(*a*) Describe briefly the function of CPU and operating system. 4

(*b*) Construct the switching circuit for the Boolean function : 4

$$AB + A'B + AB'$$