2019

B.Sc.

3rd Semester Examination

MATHEMATICS (Honours)

Paper - C7-P

[PRACTICAL]

Full Marks : 20   Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.

Group - A

Answer any one question.

Each question carries 7 marks. The question must be allotted by lottery.

1. Write a program to compute $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by using

Simpson's $\frac{1}{6}$ rule with six sub intervals.

2. Write a program to find the real root of $3x - \cos x - 1 = 0$ by Newton-Raphson method. Correct to four significant figure.

3. Write a program to find the sum of the following series :

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots + \frac{1}{n}, \text{ where } n = 29.$$

4. Find a real root of the equation $xe^x = 3$ using Regula-Falsi method, correct to four decimal plans.

5. Write a program to solve $y' = x + y$, $y(0) = 1$ for $x = 1$ with step length $h = 0.2$.

6. Using Bisection method, find a real root of the equation $f(x) = 3x - \sqrt{1 + \sin x} = 0$.

7. Evaluate $\int\limits_0^1 e^{-x^2} dx$ using Trapezoidal Rule with 10 subintervals.

8. Fit a straight line to the following data

Years (x):	1961	1971	1981	1991	2001
Production : (in tons)	8	10	12	10	16

and find the expected production in 2006.

9. Using iterative formula to compute $\sqrt[7]{125}$. Correct to five significant digits.

10. Given $y' = \sqrt{x+y}$, $y(0.4) = 0.41$, $h = 0.4$. Find $y(0.8)$ by R-K method of 2nd order.

11. Find the root of the equation $xe^x = \cos x$, using Secant method correct to four decimal places.

12. Evaluate the integral $\int_{0.2}^{1.4} \left(\sin x - \log e^x + e^x \right) dx$ by Weddle's rule's by taking $n = 12$.

13. Find the positive root of $x - \cos x = 0$ by bisection method.

14. Fit a parabola $y = a + bx + cx^2$ to the following data :

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

15. Integrate numerically $\int_{0}^{\pi/2} \sqrt{\cos\theta}\, d\theta$.

(Any method)

[Turn Over]

(4)

Group - B

*Answer any **one** question.*

*Each question carries **8 marks**. The question must be allotted by lottery.*

16. Apply Newton's backward difference formula to obtain the value of y at $x = 5.5$, using the following table

x	1	2	3	4	5
y	1	−1	1	−1	1

17. Using R-K method of 4th order solve for y at $x = 1.2, 1.4$ from $\dfrac{dy}{dx} = \dfrac{2xy + e^x}{x^2 + xe^x}$ with $x_0 = 1, y_0 = 0$.

18. The area A of a circle of diameter d is given for the following values

d :	80	85	90	95	100
A :	5026	5674	6362	7088	7854

Calculate the area of a circle of diameter 100.5

19. Solve the following systems by Gauss Elimination method : $4x + y + 3z = 11$

$$3x + 4y + 2z = 11$$

$$2x + 3y + z = 7$$

20. Solve the following by Euler's modified method :

$y^1 = \log(x+y)$, $y(0) = 2$ at $x = 1.2$ and $x = 1.4$
with $h = 0.2$.

21. Solve the following system of linear equation by LV decomposition method :

$x + y + z = 1$

$4x + 3y - z = 6$

$3x + 5y + 3z = 4$

22. Given $\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$,
$\log_{10} 659 = 2.8189$, $\log_{10} 661 = 2.8202$. Find
$\log_{10} 656$ using Newton's forward formula.

23. Evaluate $\int\limits_{0}^{1} \dfrac{dx}{x^2 + 1}$ by Gaussian quadrature taking

$n = 5$

24. Solve the equations $5x + 2y + z = 12$,
$x + 4y + 2z = 15$, $x + 2y + 5z = 20$ by Gauss-
Jacobi method.

25. The following temperature reading were taken on a day :

Time	2 a.m	6 a.m	10 a.m	2 p.m
Temperature	$40.2°$	$42.4°$	$51.0°$	$55.7°$

Find the temperature at 4 am.

26. Solve the following system by Gauss Seidal method :

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

27. Find, by power method, the numerically largest eigen value and the corresponding eigen vector of the following matrix :

$$\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$

28. If $f(1.15) = 1.0723$, $f(1.20) = 1.0954$, $f(1.25) = 1.1180$, $f(1.30) = 1.1401$, find (1.28) using Newton's backward formula.

29. From the following data, estimate the number of persons having incomes between 2000 and 2500.

Income	Below 500	500–1000	1000–2000	2000–3000
No. of persons	6000	4250	3600	1500

using Newton's backward formula.

30. From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 using Newton's forward formula.

Age (x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.32	74.48	68.48

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