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D6BEM2103

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Reg.No.....

Name:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

ECONOMICS & MATHEMATICS (DOUBLE MAIN)

GDMT6B09T: NUMERICAL ANALYSIS

Time: 2 ½ Hours

Maximum Marks: 80

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 25 Marks)

1. Determine the linear Lagrange interpolating polynomial that passes through the points (2, 4) and (5, 1).
2. Write the Three point endpoint formula.
3. State the Traezoidal rule.
4. Define a convex set in R^2 .
5. Determine any fixed points of the function $f(x) = x^2 - 2$.
6. Write Runge-Kutta method of order 4.
7. Approximate $\int_0^2 x^2 dx$ using Simpson's rule.
8. Give Newton backward-difference formula.
9. Write Taylor method of order n.
10. Show that $f(x) = x^3 + 4x^2 - 10$ has a root in [1,2].
11. Write Newton Raphson method of approximation.
12. Write modified Euler's method.
13. State Simpson's Three Eight rule.
14. Write Stirling formula.
15. Write Legendre Polynomial $P_0(x), P_1(x)$.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 35 Marks)

16. Consider the function $f(x) = \cos x - x = 0$. Approximate a root of f using Newton Raphson method.
17. Use Lagrange interpolating polynomial of degree 3 to approximate $f(9.2)=2.19722$, $f(9.5)=2.25129$, $f(10)=2.30259$, $f(11)=2.39790$.
18. Approximate the integral $\int_1^{10} \frac{1}{x} dx$ using closed Newton-cotes formula.

(PTO)

18. Using Newton forward difference formula, find an approximation to $f(2)$ for the data.

x	1	3	5	7
f(x)	24	120	336	720

20. Let $f(x) = x^2 - 6$ with $P_0 = 3$ and $P_1 = 2$, find P_3 using method of False position

21. Consider the function $f(x) = x \sin x + x^2 \cos x$. Use Three point mid point formula at $h=0.1$ to approximate $f'(1.2)$.

22. Use Euler's method to approximate the solution to $y' = y - t^2 + 1, 0 \leq t \leq 2$
 $y(0) = 0.5$ at $t = 2$.

23. Approximate $\int_0^1 e^{-x^2} dx$ by means of Midpoint formula, Simpson's rule .

SECTION C: Answer any two questions. Each carries ten marks.

24. Solve $x^3 - 9x + 1 = 0$ for the root between 2 and 4 by bisection method.

25. Compare the results of the closed and open Newton cotes formula when approximating

$$\int_0^{\frac{\pi}{4}} \sin x dx = 1 - 2\sqrt{2} \cong 0.29289322.$$

26. Use Runge-Kutta method of order four with $h=0.25$ to obtain approximation to the solution of the initial value problem $y' = t^2 + y^2, y(0) = 0$ at $t=0.2$.

27. Find $\log_{10} 301$ from the following data.

x	300	301	304	305	307
$y = \log_{10} x$	2.4771	2.4829	2.4843	2.4871

(2 x 10 = 20 Marks)