

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023
Programme Name: B Sc (NS)
Semester: II
Subject Code: UG21T5201
Subject Name: Applied Mathematics

Date: 24.05.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.
- (iii) Use of nonprogrammable scientific calculator is allowed.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. If $f(t) = \begin{cases} -1 & -1 < t < 0 \\ 1 & 0 < t < 1 \end{cases}$ then $f(t)$ is

- a) an even function
- b) an odd function
- c) neither even nor odd function
- d) both even and odd function

2. The period of $\cos 3x$ is

- a) $\frac{2\pi}{3}$
- b) $\frac{4\pi}{3}$
- c) $\frac{\pi}{3}$
- d) None of these

3. If the function $f(x)$ is even then which of the only coefficient is/are present.

- a) a_0, a_n
- b) a_n, b_n
- c) b_n
- d) a_0, a_n, b_n

4. If $L\{f(t)\} = f(s)$, then $L\{e^{-at}f(t)\}$ is

- a) $f(s - a)$

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- b) $f(s+a)$
- c) $f(s)$
- d) $f(s/a)$

5. $L^{-1}\left\{\frac{s^2-3s+4}{s^3}\right\} =$

- a) $t - 3t^2 + 4t^3$
- b) $t - 3 + 4t^3$
- c) $1 - 3t^2 + 4t^3$
- d) $1 - 3t + 2t^2$

6. The minimum value of Rank correlation coefficient is

- a) 0
- b) 1
- c) -1
- d) -10

7. The equations of the lines of regression are $y = 0.5x + a$ and $x = 0.4y + b$, then the correlation coefficient is

- a) $-\sqrt{0.2}$
- b) $\sqrt{0.2}$
- c) 0.45
- d) -0.45

8. The mode of the following data 7,7,7,9,10,11,11,11,12 is

- a) 11
- b) 12
- c) 7
- d) 7 and 11

9. In case of bisection method, the convergence is

- a) linear
- b) quadratic
- c) very slow
- d) very fast

10. Simpson's $1/3^{\text{rd}}$ and Simpson's $3/8^{\text{th}}$, both these rules can be used to evaluate the integral if n is

- a) even
- b) odd
- c) multiple of 3
- d) even and multiple of 3

Section B

Five Questions of 02 Marks each

11. Find $L(\cos^3 4t)$

12. The data given below show the number of customers visited a store in a fort- night. 40, 62, 25, 2, 50, 80, 73, 59, 59, 60, 85, 150, 49, 50, 39

Find the first quartile.

2 Marks

13. For the data:

$x:$ 2 4 6 8
 $f(x):$ 3 5 6 7

Find the value of $\int_2^8 f(x)$ by the Trapezoidal rule.

14. Find $\Delta^2 x^3$, if h is the interval of differencing.

15. For the data:

$x:$ 1 2 3 4
 $f(x):$ 3 5 6 7

Find the value Find $\Delta^2 f(1)$ and $\Delta^3 f(1)$.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. Obtain Fourier series for the functions $f(x)$ given by

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi} & -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi} & 0 \leq x \leq \pi \end{cases}$$

Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ -----(10)

17. a) Find the LaPlace transform of the function $f(t) = |t - 1| + |t + 1|, t \geq 0$

-----(5)

b) Evaluate $\int_0^\infty t e^{-3t} \sin t dt$ (5)

18. Find the inverse LaPlace transform of

a) $\frac{s+3}{s^2-4s+13}$ b) $\frac{4s+5}{(s-1)^2(s+2)}$ -----(10)

19. The following are scores of two batsmen A and B in a series of innings.

A	12	115	6	73	7	19	119	36	84	29
B	47	12	16	42	4	51	37	48	13	0

Who is better score getter and who is more consistent. -----(10)

20.a) State Newton's backward interpolation formula -----(3)

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b) Find the cubic polynomial which takes the following values

x	0	1	2	3
f(x)	1	2	1	10

Hence evaluate f(4)

------(7)

21.a) Apply Runge-Kutta fourth order method to find an approximate value of y when $x=0.2$ given that $\frac{dy}{dx} = x + y$ and $y=1$ when $x=0$.

------(5)

b) Use Simpson's 1/3 rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates.

------(5)

22. Find a real root of the equation $x \log_{10} x = 1.2$ by regular falsi method correct to four decimal places.

------(10)

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