

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2024
Programme Name: B Sc (NS)
Semester: 2
Subject Code: UG21T5201
Subject Name: Applied Mathematics

Date: 09.03.2024

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) Scientific Calculator is permitted.

Section A

CHOOSE THE CORRECT ANSWER/FILL IN THE BLANKS
(1 Marks Each)

1. The smallest period of the function $\sin\left(\frac{2n\pi x}{k}\right)$ is
2. The function $f(x)=1, 0 < x < \infty$ cannot be represented by a Fourier integral. Is it true or false.
3. If $L(f(t)) = f(s)$ then $L(e^{-at} f(t))$ is
a) $f(s-a)$ b) $f(s+a)$ c) none of these
4. $L^{-1}\left(\frac{1}{(s+a)^2}\right) =$
a) te^{at} b) te^{-at} c) e^{-at}
5. The coefficient of variation is
a) $\frac{\sigma}{x} \times 100$ b) $\frac{\sigma}{x}$ c) $\sqrt{\frac{\sigma^2}{x}} \times 100$
6. For the data

t	3	6	9	12
y(t)	-1	1	2	3

The value of $\int_3^{12} y(t) dt$ when computed by Simpson's one third rule is

a) 15 b) 10 c) 0
7. Out of Regular-Falsi method and Newton-Raphson method the rate of convergence is faster for

8. The equation of regression lines are $y = 0.5x + a$ and $x = 0.4y + b$. The correlation coefficient is
- a) $\sqrt{0.2}$ b) 0.45 c) $-\sqrt{0.2}$
9. The median of the numbers 11.10.12.13.9 is
- a) 12.5 b) 10.5 c) 11
10. Newton's forward interpolation formula is

Section B
SHORT ANSWER TYPE QUESTIONS
(2 Marks Each)

11. Define Fourier sine integral representation of a function $f(x)$.
12. Find the Laplace transform of $t^2 \sin at$.
13. Define range, semi-interquartile range, mean, mode
14. Prove with usual notations (a) $hD = \log(1 + \Delta)$ b) $\Delta = E - 1$
15. State Lagrange's interpolation formula.

Section C
ANSWER FIVE OUT OF SEVEN QUESTIONS.
(10 Marks Each)

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 $\int_0^{\infty} te^{-3t} \sin t \, dt$
-----(5)

18. Find the inverse Laplace transform of

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

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 3/8 th 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)

