

**Indian Maritime University**  
**(A Central University, Govt of India)**

**Supplementary Examinations – September/October 2024**  
**Programme Name: B Sc (NS)**

**Semester: 2**

**Subject Code: UG21T5201**

**Subject Name: Applied Mathematics**

Date: 10.09.2024

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.  $L^{-1}\left(\frac{1}{(s+a)^2}\right) = \dots\dots\dots$   
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 .....

*[Handwritten signature]*

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  $t^2 \sin t$  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  $\int_0^{\infty} t e^{-3t} \sin t dt$  -----(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.

..... ) -----  
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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 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)