

# INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

## End semester EXAMINATIONS 2022 B.Sc. (Nautical Science) Semester-2

Subject Name: APPLIED MATHEMATICS

Subject Code:UG21T5201

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Maximum Marks: 70

Duration:03 Hours

Pass marks: 35

Date – 20.06.2022

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### **Part A – 10 MCQs (10 X 01 Mark)**

1. If  $f(x)$  is a periodic function with period  $2\pi$  defined in  $[a, a+2\pi]$ , write the Euler's formula for  $a_0$ ,  $a_n$  and  $b_n$  for  $f(x)$ .
2. Define an odd function with an example.
3. State Fourier Integral theorem.
4. If  $L\{f(t)\} = F(s)$  then  $L\{e^{-at}f(t)\}$  is .....
5. State Convolution theorem.
6. Find the inverse Laplace transform of  $\frac{s^2-3s+4}{s^3}$
7. Define Standard Deviation.
8. Equation of regression lines are  $y=0.5x+a$  and  $x=0.4y+b$ . Then, correlation coefficient is .....
9. State Newton's Forward interpolation formula.
10. State Intermediate Value Theorem.

### **Part B – 5 Short Questions (05 X 02 Marks)**

11. Find the Fourier integral of  $f(x) = k$  in  $0 < x < \pi$ , where  $k$  is a constant.
12. Find the inverse Laplace transform of  $F(s) = \frac{1}{(s+a)(s+b)}$
13. Find the Laplace transform of  $\sinh 3t \cos 2t$
14. 10 participants in a contest are ranked by two judges as follows:

x	1	6	5	10	3	2	4	9	7	8
Y	6	4	9	8	1	2	3	10	5	7

Find rank correlation coefficient for this data.

15. Distinguish between Algebraic and Transcendental equations with an example.

**Part C – 7 Long Questions-Answer Any 5 (05 X 10 Marks)**

16. (a) Find the Fourier series expansion of  $f(x) = x - x^2$  in the range  $(-1, 1)$ .

(b) Obtain the half range Fourier Cosine series of  $f(x) = e^{-x}$  in  $0 < x < 2$

17. (a) Using Convolution theorem find the Laplace inverse of  $\frac{5}{(s^2+1)(s^2+25)}$

(b) Using Laplace Transform solve  $y'' + 2y' + y = e^{-t}, y(0) = 0, y'(0) = 1$

18. (a) Find the Laplace transform of  $f(t) = \begin{cases} t^2 & , 0 < t < 2 \\ t - 1 & , 2 < t < 3 \\ 7 & , t > 3 \end{cases}$

(b) Find the Laplace transform of  $f(t) = \sin^3 t$ .

19. Find mean, median, mode for this data

x	15	20	25	30	35	40	45	50	55
f	2	22	19	14	3	4	6	1	1

20. (a) Find the positive root of  $x^4 - x = 10$  correct to 3 decimal places using Newton Raphson method.

(b) Use deduction from Newton Raphson formula to find the value of  $\sqrt{5}$

21. The table gives the distances in nautical miles of the visible horizon for the given heights (in feet) above the earth's surface

x(height)	100	150	200	250	300	350	400
y(distance)	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when (a)  $x=218$ ft. (b)  $x=410$ ft.

22. (a) Solve by Picard's method up to third approximation:  $\frac{dy}{dx} = x + y^2$ ,  $y(0) = 0$

(b) Use trapezoidal rule to evaluate  $\int_0^1 \frac{1}{1+x^2} dx$  dividing the interval into 6 equal parts