INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination Dec 2019/Jan 2020

B.Tech (Marine Engineering)

Semester -II

UG11T2202/UG11T1202- Mathematics -II

Date: 03.01.2020 **Max Marks: 70**

Time: 3 Hours **Pass Marks: 35**

Part – A (compulsory)

Answer the following (10x2=20 Marks)

1. Find the Fourier coefficients a_0 for the function

$f(x) = x - x^2$, $-\pi \le x \le \pi$

2. Calculate b_1 of the Fourier series expansion for the following function:

$f(x) = x \sin x$, $0 < x < 2\pi$.

3. Find the Laplace transform of $\sqrt{t}\, e^{3t}$.

4. Find the inverse Laplace transform of $\frac{s+2}{s^2-4s+13}$

5. Show that the given equation $(ycos\, x + siny + y\,)dx + (\sin x + x\, cosy + x)dy = 0$ is exact and find its solution.

6. Solve the linear equation: $\frac{dx}{dy} + \frac{x}{y\, logy} = \frac{1}{y}$.

7. Obtain the complementary function (CF) for the equation $\frac{d^2y}{dt^2} - 6\frac{dy}{dt} + 9y = 0$.

8. A bag contains 8 white balls and 6 red balls. Find the probability of drawing two white balls.

9. A random variable x has the following probability function

x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k.

10. The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that exactly two will be defective.

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

11. Find the Fourier series expansion of $f(x) = 2x - x^2\ in\ (0,3)$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} \pm \ldots - \infty = \frac{\pi^2}{12}$. (10 marks)

12. a) Find the inverse Laplace transform of $\frac{5s+3}{(s-1)(s^2+2s+5)}$. (5 marks)

b) Use Laplace transform method to solve

$\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t\ with\ x(0) = 2\ , x'(0) = -1.$ (5 marks)

13. a) Apply Convolution theorem to evaluate $L^{-1}\left(\frac{1}{(s^2+1)(s^2+9)}\right)$ (5marks)

b) Evaluate the given integral using Laplace transform.

$\int_0^\infty (\frac{\sin mt}{t})\, dt$ (5 marks)

14. a) Solve : $\frac{d^2y}{dx^2} - 4y = x \sinh x$. (5 marks)

b) Solve by method of variation of parameters,

$y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$. (5 marks)

15. a) Find the solution for the Homogenous differential equation:

$\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right) dy = 0$ (5marks)

b) If the stream lines (paths of fluid particles) of a flow around a corner are xy=constant, find their orthogonal trajectories(called equipotential Lines.) (5marks)

16. a) In sampling a large number of parts manufactured by a machine, the Mean number of defectives in a sample of 20 is 2. Out of 1000 such Samples, how many would be expected to contain at least 3 defective Parts. (5 marks)

b) Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first is a king and the second a queen if the first card is

(i) replaced (ii) not replaced. (5 marks)

17. a) Find the moment generating function of the exponential distribution $f(x) = \frac{1}{c}\, e^{-\frac{x}{c}}, 0 \le x \le \infty, c > 0$. Hence find its mean and S.D. (5 marks)

b) A pair of dice is tossed twice. Find the probability of scoring 7 points

(i) once, (ii) at least once . (5 marks)

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