INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination Dec 2019/Jan 2020

B.Tech (Marine Engineering)

Semester -II

UG11T3202- 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. Obtain the coefficient a_0 of Fourier series for $f(x)= e^{-x}$ in the interval $0<x<2\pi$.
2. Find the Laplace transforms of $\cos^3 2t$.
3. Find the Laplace transforms of $(1-e^t)/ t$
4. Find the Inverse Laplace transforms of $\frac{s}{(2s-1)(3s-1)}$
5. Solve $\frac{dy}{dx}= e^{3x-2y} + x^2e^{-2y}$
6. Solve $(1+2xy \cos x^2 - 2xy)dx + (\sin x^2 - x^2)dy = 0$
7. Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$
8. A and B be events with P(A) = 0.5 P(B)= 0.4 $P(A\cap B)=0.2$.
   Find 1. P(A/B) 2. P(AUB) 3. P(B')
9. Find mean and variance for the following distribution
   $f(x) = 2x$; $0< x<1$
10. Find Mean , Median and Mode of the discrete random variable x whose probability distribution is given below:

$X=x_i$	0	1	2	3
$P(X=x_i)$	0.008	0.096	0.384	0.512

Part – B

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

11. a) Find the Fourier series of $f(x)=x^2$ in the interval $(0, 2\pi)$. (5 Marks)

    b) Obtain the Fourier expansion of $x \sin x$ as a cosine series in (o, π)

    Hence deduce $\frac{1}{1\cdot 3} - \frac{1}{3\cdot 5} + \frac{1}{5\cdot 7} + \cdots = \frac{\pi-2}{4}$ (5 Marks)

12. a) Find the Laplace transform of $\int_0^\infty e^{-t}\left(\frac{\cos at - \cos bt}{t}\right) dt$ (5 Marks)

    b) Apply Convolution theorem to evaluate $L^{-1}\frac{1}{(s^2+1)(s^2+9)}$. (5 Marks)

13. a) Solve y(log y) dx+ (x-log y) dy =0 (5 Marks)

b) Solve $(D^2-2D+1)\, y= x\, e^x \sin x$ (5 Marks)

14. a) A factory has two Machines-I and II. Machine-I produces 60% of Items and Machine-II produces 40% items of the total output. Further 2% of the items produced by Machine-I are defective whereas 4% produced by Machine-II are defective. If an item is chosen and is found to be defective, what is the probability that it is from the Machine –I. (5 Marks)

b) Find Moment generating function of the exponential distribution

$f(x) = 1/c\ e^{-x/c}$; $0 < x < \infty$, c>0 .

Use this function to find mean, variance and standard Deviation.

(5 Marks)

15. a) 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

(i) exactly two will be defective

(ii) At least two is defective

(iii) None will be defective (5 Marks)

b) In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10, Using Poisson distribution calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 10,000 packets.

(5 Marks)

16. a) Obtain Fourier series for the function

$$f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x) & ,1 \le, \ x \le 2 \end{cases}$$

Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\ \infty = \frac{\pi^2}{8}$ (5 Marks)

b) Solve by the method of variation of parameters

$(D^2 -2D+2)y= e^x \tan x$ (5 Marks)

17. a) Find Inverse Laplace transform using Convolution theorem of

$F(s) = \frac{1}{s^2(s^2+1)}$ (5 Marks)

(b) Solve by using Laplace transform method $(D^3-3D^2+3D-1)y=t^2e^t$ given that y(0)=1 , y'(0) =0 , y"(0)=-2 (5 Marks)

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