



6. The integrating factor of the given differential equation is  $\frac{dx}{dy} + 3\frac{x}{y} = \frac{1}{y^2}$

$$\frac{dx}{dy} + \frac{3x}{y} = \frac{1}{y^2}$$

- A.  $e^{y^3}$       B.  $y^3$       C.  $x^3$       D.  $-y^3$

7. What is the general solution of the differential equation  $\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 9x = 0$

- A.  $x = (C_1 + C_2t)e^{-3t}$       B.  $x = (C_1 + C_2)e^{-3t}$   
 C.  $x = C_1 + C_2te^{-3t}$       D.  $x = C_1 + C_2e^{-3t}$

8. If A and B are independent and  $P(A) = 1/2$  and  $P(B) = 1/3$  then value of

- A.  $5/6$       B.  $1/6$       C.  $1/3$       D.  $1/2$

9. The value of  $k =$  \_\_\_\_\_ for which the random variable  $x$  has the following probability distribution function. (Fill up the blank)

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

10. Which Probability distribution has same mean, median and mode  
 A. Binomial      B. Poisson      C. Normal      D. Geometric

### Section B

Answer the following

[5x2 = 10 Marks]

11. Obtain the coefficient  $a_0$  of Fourier series for  $f(x) = e^x$  in the interval  $0 < x < 2\pi$ .

12. Solve :  $\frac{dy}{dx} = e^{-2y}(e^{3x} + x^2)$

13. Find the Laplace transforms of  $e^{2t} \cos 4t$ .

14. Solve :  $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$

15. Find mean for the following probability distributing function

$$f(x) = 2x ; \quad 0 \leq x \leq 1$$

### Section C

Answer any 5 out of 7 questions

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

Hence deduce that  $\frac{\pi^2}{12} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$  (10)

17. a) Solve the given exact differential equation

$(x^4 - 2xy^2 + y^4) dx - (2x^2y - 4xy^3 + \sin y) dy = 0$  (05)

b) Solve:  $\frac{dy}{dx} + \frac{3y}{x} = \frac{\sin x}{x^3}$  (05)

18. a) Solve  $(D^2+3D+2) y = \sin 2x$  (05)

b) Solve by the method of variation of parameters  $(D^2 + 1)y = \sec x$  (05)

19. a) Evaluate  $\int_0^\infty e^{-3t} t^5 dt$  (05)

b) Find Inverse Laplace transform of  $\left[ \frac{1}{(s-1)(s+2)(s+1)} \right]$  (05)

20. a) Find Inverse Laplace transforms of  $\frac{1}{s^2(s+5)}$  (05)

b) Using Convolution theorem evaluate  $L^{-1}\left[\frac{1}{(s+a)(s+b)}\right]$  (05)

21. 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. (05)

b) The random variable  $x$  has the probability distribution as shown below.

X:	1	2	3	4
P(x):	0.3	0.2	0.4	0.1

Find i)  $P(0.5 < x < 3.5)$

ii) Expected value of  $x$ ,

iii) Variance

iv) Standard deviation (05)

22.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 (05)

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. (05)

