Bharathidasan Engineering College, Nattrampalli.
Question Bank

IMPORTANT QUESTIONS (FAQ)

PERIOD: AUG-DEC 2024 | BATCH: 2024 – 2025

BRANCH: EEE | YEAR/SEM: II/03

SUB CODE/NAME: MA3303 - PROBABILITY & COMPLEX FUNCTION

Unit-I: Probability Random Variables

Part - A

1. State the axioms of probability. **(April/May 2024)**
2. The mean of Binomial distribution is 20 and standard deviation is 4. Find the parameters of this distribution. **(April/May 2024)**
3. I A, B and C are 3 events such that $P(A) = P(B) = P(C) = \frac{1}{4}$, $P(A \cap B) = P(B \cap C) = 0,\ P(A \cap C) = \frac{1}{8}$. Find the probability that atleast 1 of the events A, B and C occurs. **(Nov/Dec 2023)**
4. A continuous random variable X that can assume any value between $x = 2$ and $x = 5$ has a density function given by $f(x) = \left(\frac{2}{27}\right)(1 + x)$. Find $P(X < 4)$. **(Nov/Dec 2023)**
5. Two pair dice are tossed. Find the probability of the outcome of the second die is greater than the outcome of the first die. **(April/May 2023)**
6. A bag contains 8 red, 4 green and 8 yellow balls. A ball is drawn at random from the bag, and it is not a red ball. What is the probability that is a green ball? **(April/May 2023)**
7. Using the axioms of probability, prove $P(A^c) = 1 - P(A)$. **(Nov/Dec 2022)**
8. Consider the random experiment of tossing a fair of coin three times. If X denotes the number of heads obtained fond $P(X < 2)$. **(Nov/Dec 2022)**
9. Let A and B be two events such that $P(A) = 0.5,\ P(B) = 0.3$ and $P(A \cap B) = 0.15$ Compute $P(B/A)$ and $P(\overline{A} \cap B)$. **(Nov/Dec 2019)**
10. Define discrete random variable with an example. **(April/May 2019)**
11. Define continuous random variable with an example. **(April/May 2019)**
12. Let A and B be two events such that $P(A) = \frac{1}{3},\ P(B) = \frac{3}{4}$ and $P(A \cap B) = \frac{1}{4}$. Compute $P(A/B)$ and $P(\overline{A} \cap \overline{B})$. **(April/May 2019)**
13. Find the moment generating function of Poisson distribution. **(Nov/Dec 2014, April/May 2015)**
14. Find c, if a continuous random variable X has the density function $f(x) = \frac{c}{1 + x^2}, \quad -\infty < x < \infty$ **(Nov/Dec 2014)**
15. Find the moment generating function of Binomial distribution. **(May/June 2013)**

16. Find the moment generating function of Uniform distribution. **(A.U. April'05, Dec'06)**

17. If $f(x) = \begin{cases} Ke^{-x} & x > 0 \\ 0 & otherwise \end{cases}$ is the p.d.f of a random variable X, then find the value of K.

18. If a random variable 'X' has the MGF, $M_x(t) = \dfrac{2}{2-t}$, find the variance of 'X'.

Part - B

1. (a) The CDF of the random variable X is defined by $F_X(x) = \begin{cases} 0, & x < 2 \\ C(x-2), & 2 \leq x < 6 \\ 1, & x \geq 6 \end{cases}$

    1. What is the value of C?
    2. With the above value of C, what is $P[X > 4]$?
    3. With the above value of C, what is $P[3 \leq X \leq 5]$?

   (b) The average percentage of marks of candidates in an examination is 42 will a standard deviation of 10, the minimum for a pass is 50%. If 1000 candidates appear for the examination, how much can be expected marks. If it is required,that double that number should pass, what should be the average percentage of marks? **(April/May 2024)**

2. (a) A shopping cart contains ten books whose weights are as follows: There are four books with a weight of 1.8 lbs each, one book with a weight of 2 lbs, two books with a weight of 2.5 lbs each, and three books with a weight of 3.2 lbs each.

    1. What is the mean weight of the books?
    2. What is the variance of the weights of the books?

   (b) Given that X is normally distribution with mean 10 and probability $P(X > 12) = 0.1587$. What is the probability that X will fall in the interval $(9,\ 11)$. **(April/May 2024)**

3. A student buys 1000 integrated circuits (ICs) from supplier A, 2000 ICs from supplier B and 3000ICs from supplier C. He tested the ICs and found that the conditional probability of an IC being defective depends on the supplier from whom it was bought. Specifically, given that an IC came from supplier A, the probability that it is defective is 0.05; given that an IC came from supplier B, the probability that it is defective is 0.10 and given that an IC came from supplier C, the probability that it is defective is 0.10. If the ICs from the probability that it is defective.**(April/May2023)**

4. State and prove the "forgetfulness" Property of the Geometric distribution. **(April/May 2023)**

5. The weights in pounds of parcels arriving at a package delivery company's warehouse can be modeled by an N(5; 16) normal random variable X.

   (a) What is the probability that a randomly selected parcel weights between 1 and 10 pounds?

   (b) What is the probability that a randomly selected parcel weights more than 9 pounds? **(April/May 2023)**

6. A lot of 100 semiconductor chips contain 20 that are defective. Two are selected randomly, without replacement, from the lot.
   (a) What is the probability that the first one selected is defective?
   (b) What is the probability that the second one selected is defective given that the first one was defective?
   (c) What is the probability that both are defective? **(Nov/Dec 2022)**

7. A production line manufactures 1000 ohm resistors that have 10% tolerance. Let X denotes the resistance of a resistor. Assuming that X is a normal random variable with mean 1000 and variance 2500. Find the probability that a resistor picked at random will be rejected. **(Nov/Dec 2022)**

8. Derive Poisson distribution from the binomial distribution. **(Nov/Dec 2021)**

9. Companies B_1, B_2, and B_3 produce 30%, 45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of these cars produced from are defective.
   (a) What is the probability that a car purchased is defective?
   (b) If a car purchased is found be defective, What is the probability that this car is produced by company B_1? **(Nov/Dec 2019)**

10. A given lot of IC chips 2% defective chips. Each is tested before delivery. The tester itself is not totally reliable. Probability of tester says the chip is good when it is really good is 0.95 and probability of tester says chip is defective when it is actually defective is 0.94. Ia tested device is indicated to be defective, what is the probability that it is actually defective. **(Nov/Dec 2004)**

11. Find the moment generating function of the random variable X whose probability function $P(X = x) = \frac{1}{2^x}$, $x = 1, 2, \ldots$ Hence find its mean. **(Nov/Dec 2019)**

12. There are 3 boxes containing respectively. 1 white, 2 red and 3 black balls; 2 white, 3 red and 1 black balls; 3 white, 1 red and 2 black balls. A box is choosen at random and from it two balls drawn at random. The two balls are 1 red and 1 white. What is the probability that they came from second box? **(Nov/Dec 2019)**

13. A bag contains 3 black and 4 white balls. Two balls are drawn at random one at a time without replacement.
   (a) What is the probability that the second ball drawn is white?
   (b) What is the conditional probability that the first ball drawn is white if the second ball is known to be white? **(April/May 2019)**

14. State and prove Baye's Theorem (or) Theorem of probability of case.**(April/March 2019)**

15. A consulting firm rents cars from three rental agencies in the following manner: 20% from agency D, 20% from agency E and 60% from agency F. If 10% cars from D, 12% of cars from E and 4% of cars from E and 4% of cars from F have bad tyres. What is the probability from that the firm will get a car with bad tyres? Find the firm will get a car with bad tyres? Find the probability that a car with bad tyres is rented from agency F. **(April/May 2019)**

16. The cumulative distribution function of a random variable X is $F(x) = 1-(1+x)e^{-x}$, $x > 0$. Find the probability density function of X, Mean and Variance of X. **(April/May 2019)**

17. Deduce the mean and four moments of the Poisson distribution from Binomial distribution as a limiting case. **(April/May 2019)**

18. In a normal distribution, 34% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. **(April/May 2019)**

19. State and prove Baye's Theorem (or) Theorem of probability of case.**(April/March 2019)**

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SUB CODE/NAME: MA3303 - PROBABILITY & COMPLEX FUNCTION

Unit-II: Two Dimensional Random Variables

Part - A

1. State central limit theorem. **(April/May 2024)**

2. If X and Y are independent random variables, prove that $Cov(X,\ Y) = 0$. **(April/May 2024)**

3. State the properties of the distribution function of a two dimensional random variable $(X,\ Y)$. **(Nov/Dec 2023)**

4. The life time of a certain brand of an electric bulb may be considered a random variable with a mean 1200h and standard deviation 250h. Find the probability, using central limit theorem, that the average life time of 60 bulbs exceeds 1250h. **(Nov/Dec 2023)**

5. Given two random variables X and Y with the joint CDF $F_{XY}(x,\ y)$ and marginal CDFs $F_x(X)$ and $F_y(Y)$, compute the joint probability that X is greater than a and Y is greater than b. **(April/May 2023)**

6. The Joint PMF of two random variables X and Y is given by

$$F_{xy}(x,\ y) = \begin{cases} \frac{1}{18}(2x+y) & x = 1,\ 2; \quad y = 1,\ 2. \\ 0 & otherwise \end{cases}$$

What is the marginal PMF of X? **(April/May 2023)**

7. For a Bi-variate random variable (XY). Prove that if X and Y are independent, then every event $a < X \leq b$ is independent of the other event $c < X \leq d$. **(Nov/Dec 2022)**

8. Let the joint probability mass function of $(X,\ Y)$ given by

$$P_{xy}(x,\ y) = \begin{cases} k(x+y) & x = 1,\ 2,\ 3; \quad y = 1,\ 2. \\ 0 & otherwise. \end{cases}$$

Find the value of k. **(Nov/Dec 2022)**

9. What is the angle between the two regression lines? **(April/May 2015)**

10. Define the distribution function of two dimensional random variable $(X,\ Y)$. State any one property. **(April/May 2015)**

11. Given the random variable X with density function

$$f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0 & elsewhere \end{cases}$$

Find the PDF of $Y = 8X^3$. **(Nov/Dec 2014)**

12. X and Y are two random variables with joint pdf

$$f(x,\ y) = \begin{cases} x+y, & 0<x<1, \quad 0<y<1 \\ 0, & otherwise. \end{cases}$$

Check whether X and Y are independent. **(Nov/Dec 2011)**

13. The two regression equations are $3x+2y=26$ and $6x+y=31$. Find the correlation coefficient between x and y. **(Nov/Dec 2011)**

14. Let $(X,\ Y)$ be a two dimensional random variable. Define covariance of $(X,\ Y)$. if X and Y are independent, what will be the covariance of $(X,\ Y)$?

15. The two regression lines are $x+6y=14$, $2x+3y=1$. Find the mean values of x and y.

Part - B

1. The joint PDF of the random variables X and Y is defined as follows:

$$f_{XY}(x,\ y) = \begin{cases} 25e^{-5y}, & 0<x<0.2, y>0 \\ 0, & otherwise \end{cases}$$

(i) Find the marginal PDFs of X and Y.

(ii) What is the correlation coefficient of X and Y? **(April/May 2024)**

2. (a) The details pertaining to the experience of technicians in a company (in a number of years) and their performance rating is provided in the table below. Using these values, fit the straight line. Also estimate the performance rating for a technician with 20 years of experience.

Experience of Technicians (in year)	16	12	18	4	3	10	5	12
Performance rating	87	88	89	68	78	80	75	83

(b) The joint PDF of two random variables X and Y is given by $f_{XY}(x,\ y)$. If we define the random variable $U = XY$, determine the PDF of U. **(April/May 2024)**

3. (a) The joint probability mass function of $(X,\ Y)$ is given by

$$p(x,\ y) = k(2x+3y), \qquad x=0,\ 1,\ 2;\ y=1,\ 2,\ 3.$$

Find all the marginal distributions. **(Nov/Dec 2023)**

(b) The joint probability density function of a two-dimensional random variable $(X,\ Y)$ is given by

$$f(x,\ y) = xy^2 + \frac{x^2}{8}, \quad if\ 0 \le x \le 2,\ 0 \le y \le 1.$$

Compute $P(X>1)$, $P\left(Y<\frac{1}{2}\right)$ and $P\left(X>1/Y<\frac{1}{2}\right)$

4. If X and Y each follow an exponential distribution with parameter 1 and are independent, find the pdf of $U = X - Y$. **(Nov/Dec 2023)**

5. The joint CDF of two discrete random variables X and Y is given as follows:

$$F_{xy}(x,\ y) = \begin{cases} \frac{1}{8} & x = 1, \quad y = 1 \\ \frac{5}{8} & x = 1, \quad y = 2 \\ \frac{1}{4} & x = 2, \quad y = 1 \\ 1 & x = 2, \quad y = 2 \end{cases}$$

Determine the joint PMF of X and Y; Marginal PMF of X and Marginal PMF of XY. **(April/May 2023)**

6. The joint PDF of the random variables X and Y is defined as follows:

$$f_{x,\ y}(x,\ y) = \begin{cases} 25e^{-5y}, & 0 < x < 0.2, \quad y > 0 \\ 0 & elsewhere \end{cases}$$

What is the covariance of X and Y? **(April/May 2023)**

7. Consider an experiment of drawing randomly three balls from an uncontaining two red, three white and four blue balls. Let $(X,\ Y)$ be a bi-variate random variable where X and Y denote respectively the number of red and white balls chosen.

   (i) Find the range of $(X,\ Y)$.

   (ii) Find the joint probability mass function of $(X,\ Y)$.

   (iii) Find the marginal probability function of X and Y.

   (iv) Are X and Y independent? **(Nov/Dec 2022)**

8. Test two integrated circuits one after the other. on each test, the possible outcome are α (accept) and r (reject). Assume that all circuits are acceptable with probability 0.9 and that the outcomes of successive tests are independent. Count the number of successful tests Y before you observe the first reject. (If both tests are successful, let $Y = 2$.) **(Nov/Dec 2022)**

   (i) Find the joint probability mass function of X and Y.

   (ii) Find the correlation between X and Y.

   (iii) Find the covariance of X and Y.

9. If the joint density function of the two random variables X and Y **(Nov/Dec 2019)**

$$f(x,\ y) = \begin{cases} e^{-(x+y)}, & x \geq 0, \quad y \geq 0 \\ 0, & otherwise \end{cases}$$

   (i) $P(X < 1)$

   (ii) $P(X + Y < 1)$

10. If the joint distribution function of X and Y is given by **(Nov/Dec 2019)**

$$f(x,\ y) = \begin{cases} (1-e^{-x})(1-e^{-y}), & for\ X > 0,\ \ Y > 0 \\ 0, & otherwise. \end{cases}$$

(i) Find the marginal density function of X and Y.

(ii) Are X and Y are independent?

(iii) $P(1 < X < 3,\ 1 < y < 2)$.

11. The regression equations are $3x + 2y = 26$ and $6x + y = 31$. Find the correlation coefficient between X and Y. **(April/May 2019)**

12. Find the marginal distribution function of X and Y if **(April/May 2019)**

$$f(x,\ y) = \begin{cases} \frac{6}{5}\left(x + y^2\right), & 0 \le x \le 1 \quad 0 \le y \le 1 \\ 0 & otherwise. \end{cases}$$

13. The joint probability mass function of $(X,\ Y)$ is given by

$$P(X,\ Y) = k(2x + 3y),\ x = 0,\ 1,\ 2;\ y = 1,\ 2,\ 3.$$

Find k and the marginal and conditional probability distributions. Also find the probability distribution of $(X + Y)$. **(Nov/Dec 2018 & 2014)**

14. If X and Y are independent exponential distribution with parameter 1, then find PDF of $U = X - Y$. **(Nov/Dec 2018)**

15. If the PDF of a two dimensional random variable $(X,\ Y)$ is given by

$$f(x,\ y) = x + y,\ 0 \le (x,\ y) \le 1.$$

Find the PDF of $U = XY$. **(April/May 2017)**

16. Two dimensional random variable X and Y have the joint density

$$\begin{cases} x + y & 0 < x < 1;\quad 0 < y < 1. \\ 0 & otherwise. \end{cases}$$

Obtain the correlation coefficient between X and Y. Check whether X and Y are independent. **(April/May 2017)**

17. State and prove Central Limit theorem.

BHARATHIDASAN ENGINEERING COLLEGE, NATTRAMPALLI.

QUESTION BANK - IMPORTANT QUESTIONS (FAQ)

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SUB CODE/NAME: MA3303 – PROBABILITY AND COMPLEX FUNCTION

UNIT-III: ANALYTIC FUNCTIONS

PART-A

1. Prove that the bilinear transformation has atmost two fixed point.
2. Show that $(x, y) = 3x^2y + 2x^2 - y^3 - 2y^2$ is a harmonic.
3. Prove that $u = e^x \sin y$ is harmonic.
4. Find the value of ‘m’ if $u = 2x^2 - my^2 + 3x$ is harmonic.
5. Find the image of the circle $|z| = 3$ under the transformation $w = 2z$.
6. Find the image of the circle x=2 under the transformation $w = \frac{1}{z}$
7. Find the image of the circle $|z$-2i$|$ = 2 under the transformation $w = \frac{1}{z}$.
8. Find the invariant points of $\omega = \frac{z}{z^{2-2}}$
9. Define conformal mapping**. (APRIL/ MAY 2023)**
10. Find the fixed points of bilinear transformation$w = 2 - \frac{2}{z}$. **(APRIL/MAY2024)**
11. If $(z) = z^2$ analytic? Justify
12. Show that $(z) = |z|^2$ is differentiable at $z = 0$ but not analytic at $z = 0$.
13. Check whether $w = zinz$ analytic everywhere or not. **(APRIL/MAY2024)**
14. For what values of a,b,c the function $f(z) = (x - 2ay) + i(bx - cy)$ is analytic.
15. Find the constants a,b if $f(z) = x + 2ay + i(3x + by)$ is analytic.
16. Find the constants a,b,c if $f(z) = x + ay + i(bx + cy)$ is analytic.
17. Prove that $w = \sin 2z$ is analytic function.
18. Find the fixed point (or) Invariant point (or) critical point.

PART-B

1. If $f(z)$ is a regular function of z then prove that $\left(\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial Y^2}\right) |F(Z)|^2 = 4||F(Z)|^2|$
   (AP/MAY-2023)
2. Show that $(x, y) = \log(x^2 + y^2)$ is a harmonic function.also Find a $f(z)$ function
   (AP/MAY-2023)
3. P.T $U = x^2 - y^2$ and $y = \frac{-y}{x^2+y^2}$ harmonic function but not harmonic conjugate
   (AP/MAY-2024)
4. Find the image of $|Z - 2i| = 2$ under the transformation of $W = \frac{1}{Z}$
   (AP/MAY-2024)
5. Find the image of region into infinite stripe $\frac{1}{4} < y < \frac{1}{2}$ under the transformation $W = \frac{1}{Z}$
6. Discuss the conformal transformation $W = sinz$
7. Determine the Analytic function whose real part is $\frac{sin2x}{cosh2y-cos2x}$
8. Find the Analytic function whose imaginary part is $e^x(xsiny + ycosy)$
9. Find the image of $1 < x < 2$ under the mapping $W = \frac{1}{Z}$
10. Find the image of $|Z - 3i| = 3$ under the transformation of $W = \frac{1}{Z}$
11. If $f(Z) = U + IV$ is analytic find if $U = \frac{2sin2x}{e^{2y}+e^{-2y}-2cosx}$ **(AP/MAY-2024)**
12. Determine the Analytic function whose real part is $\frac{sin2x}{cosh2y-cos2x}$
13. Find the bilinear transformation of the points $\boldsymbol{Z} = \mathbf{1}, \boldsymbol{i}, -\mathbf{1}$ $\;into\; \boldsymbol{W} = \mathbf{0}, \mathbf{1}, \infty$
14. Find the bilinear transformation of the points $\boldsymbol{Z} = -\mathbf{1}, -\boldsymbol{i}, \mathbf{1}$ $\;into\; \boldsymbol{W} = \infty, \boldsymbol{i}, \mathbf{0}$
15. Find the bilinear transformation of the points $\boldsymbol{Z} = 0, \ , \infty$ $into\; \boldsymbol{W} = \boldsymbol{i}, 1. -\boldsymbol{i}$
16. Find the bilinear transformation of the points $\boldsymbol{Z} = \mathbf{1}, \boldsymbol{i}, -\mathbf{1}$ $\;into\; \boldsymbol{W} = \boldsymbol{i}, \mathbf{0}, -\boldsymbol{i}$
    (AP/MAY-2024)
17. Find the bilinear transformation of the points $\boldsymbol{Z} = -\mathbf{1}, 0, \mathbf{1}$ $\;into\; \boldsymbol{W} = -1, -\boldsymbol{i}, 1$
18. Find the bilinear transformation of the points $\boldsymbol{Z} = \mathbf{1}, \ \boldsymbol{i}, -\mathbf{1}$ $\;into\; \boldsymbol{W} = 2, \boldsymbol{i}, -2$
19. Find the bilinear transformation of the points $\boldsymbol{Z} = -\boldsymbol{i}, 0\ \boldsymbol{i}$ $\;into\; \boldsymbol{W} = -1, \ , \boldsymbol{i}, 1$
20. Find the bilinear transformation of the points $\boldsymbol{Z} = 0, -\mathbf{1}, \boldsymbol{i}, \mathbf{1}$ $\;into\; \boldsymbol{W} = \boldsymbol{i}\ \ 0, \infty,$
21. Whether the function $2xy + i(x^2 - y^2)$ is analytic or not?

UNIT 5 – ORDINARY DIFFERENTIAL EQUATIONS

PART – A

1. Solve $(D^2 + 5D + 6) = 0.$

2. Solve $(D^2 + 4D + 6) = 0.$

3. Find the Particular integral of $(D^2 - 4) = e^{-4x}.$

4. Find the Particular integral of $(D^3 + 4D) = sin2x.$

5. Solve $(D^2 + 1) = 0.$

6. Solve $(D^2 + 6D + 9) = 0.$

7. Find the particular integral of $(D^2 + 4) = cos2x.$

8. Find the particular integral of $(D^2 - 4) = e^{-4x}.$

9. Reduce $(\boldsymbol{x^2D^2 - 3xD + 3}) = \boldsymbol{x}$ into a differential equation with constant coefficient.

10. Reduce $(\boldsymbol{x^2D^2 + xD + 1}) = \boldsymbol{0}$ into a differential equation with constant coefficient.

11. Reduce $((\boldsymbol{2x+3})^2 - (\boldsymbol{2x+3})\boldsymbol{D} - \boldsymbol{12}))\boldsymbol{y} = \boldsymbol{6x}$ into a differential equation with constant coefficient.

12. Find the particular integral of $\boldsymbol{y'' - 6y' + 9y = 2e^{3x}}.$

13. Find the particular integral of $(D-1)^2 y = e^x \sin x$

14. Convert $x^2 y' - 2xy' + 2y = 0$ into a linear differential equation with constant coefficients.

into a differential equation

15. Solve $(D^2 + 6D + 9)\,y = 0$

16. Find the particular integral of $\left(D^2 - 2D + 1\right) y = \cosh x$

17. Transform the differential equation $\left(x^2D^2 + 4xD + 2\right) y = x + \dfrac{1}{x}$

with constant coefficient.

18. Transform the equation $(2x-1)^2 y'' - 4(2x-1)y' + 8y = 8x$ into the linear equation with constant coefficients.

19. Find the differential equation of x(t) given $\dfrac{dy}{dt} + x = \cos t, \; \dfrac{dx}{dt} + y = e^{-t}$

20. Solve $(D^3 + 1) = 0.$ **(Nov18)**

21. Transform the equation $xy'' + y' + 1 = 0$ into the linear equation with constant coefficients **(Nov18)**

22. Find P.I of $(D-a)^2 y = e^{ax} sinx$

23. Solve $x^2 y'' xy' + y = 0$

PART – B

HOMOGENEOUS EQUATIONS

1. Solve the differential equation $(D^2 + 3D + 2) = e^{-3x}$.
2. Solve the differential equation $(D^2 - 4D + 4) = e^{2x} + cos2x$.
3. Solve the differential equation $(D^2 - 3D + 2) = sin3x$.
4. Solve the differential equation $(D^2 - 5D + 6) = x^2 + 3$.
5. Solve the differential equation $(D^2 + 5D + 4) = e^{-x} sin2x$.
6. Solve the differential equation $(D^2 + 2D + 1) = e^{-x} x^2$.
7. Solve the differential equation $(D^2 + 4) = xsinx$.
8. Solve the differential equation $(D^2 + 4D + 5) = e^x + x^2 + cos2x + 1$. **(Nov18)**

Euler's and Legendre's equations

9. Solve $(x^2 D^2 + 4xD + 2) = logx$.
10. Solve $((x+1)^2 D^2 + (x+1) + 1) = 4\cos[\log(x+1)]$. **(Jan-18)**
11. Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin(\log(1+x))$
12. Solve $(x^2D^2 - 2xD - 4)y = x^2 + 2\log x$

Method of variation of parameters

13. Solve $(D^2 + 1) = cosecx$. by the method of variation of parameters
14. Solve $(D^2 + a^2) = tanax$. by the method of variation of parameters
15. Solve $(D^2 + 4) = sec2x$. by the method of variation of parameters
16. Solve the equation $(D^2 + 1)y = x\sin x$ by the method of variation of parameter

SIMULTANEOUS EQUATION

17. Solve the simultaneous equations Dx+y=sin2t and –x+Dy=cos2t.
18. Solve dx/dt+ $4x + 3y = t$; $dy/dt + 2x + 5y = e^{2t}$

19. Solve $\frac{dx}{dt} + 5x - 2y = t$; $\frac{dy}{dt} + 2x + y = 0$

20. Solve the simultaneous equation $\frac{dx}{dt} - y = t$ and $\frac{dy}{dt} + x = t^2$ given $x(0) = y(0) = 2$.

21. Solve $\frac{dx}{dt} - \frac{dy}{dt} + 2y = cos2t$, $\frac{dx}{dt} - 2x + \frac{dy}{dt} = sin2t$

22. Solve $\frac{dx}{dt} + \frac{dy}{dt} + 3x = sint$, $\frac{dx}{dt} + y - x = cost$

23. Solve $(D^2 + 2D + 1) = e^x sin2x$ by using the method of undetermined coefficients.

24. Solve $(D^2 - 2D)y = 5\, e^x cosx$ by using the method of undetermined coefficients