Code No: F-15105

FACULTY OF SCIENCE

B.A./B.Sc. (CBCS) II- Semester Examination, June/July 2024

Subject : Mathematics
Paper – II : Differential Equations

Time: 3 Hours **Max. Marks: 80**

PART – A

Note: Answer any eight questions. **(8x4= 32 Marks)**

1. Solve $x\sqrt{1+y^2} + y\sqrt{1+x^2}\,\frac{dy}{dx} = 0$.

2. Solve $\frac{dy}{dx} = \frac{x+3y+5}{2x+6y+7}$.

3. Solve $\frac{dx}{1+x} = \frac{dy}{1+y} = \frac{dz}{z}$.

4. Solve $x^2p^2 + 3xyp + 2p^2 = 0$ where $= \frac{dy}{dx}$.

5. Find the general solution of $y = xp + \frac{a}{p}$.

6. Find the orthogonal trajectories of $y^2 = 4ax$.

7. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 15y = 0$.

8. Solve $(D^2 - 2mD + m^2)y = e^{mx}$ where $D \equiv \frac{d}{dx}$.

9. Find a particular integral of $(D^2 - 3D + 2)y = sin\,3x$.

10. Solve $2x^2y'' + 3xy' - y = 0$ given that $y_1 = \frac{1}{x}$ is a solution.

11. Form a partial differential equation by eliminating the arbitrary constants a and b from $z = ax^2 + by^2$.

12. Solve $(9x^2D^2 + 3xD + 1)y = 0$.

PART – B

Note: Answer all the questions. **(4x12= 48 Marks)**

13. (a) Solve $y(x+y)\,dx - x^2\,dy = 0$.

(OR)

(b) Solve $(x^3 - 2y^2)\,dx + 2xy\,dy = 0$.

14. (a) Solve $y - 2px = x^2p^4$.

(OR)

(b) Solve $y = 2px + yp^2$.

15. (a) Solve $(D^3 - 1)y = xe^x$.

(OR)

(b) Solve $(D^2 + 4)y = x\cos x$.

16. (a) Using the method of variation of parameters, solve $y'' + 9y = cosec\, 3x$.

(OR)

(b) Solve $x^3y''' + 3x^2y'' + xy' + 8y = 65\cos(\log x)$.

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Code No: F-15106

FACULTY OF SCIENCE

B.A./B. Sc. (CBCS) II – Semester Examination, June/July 2024

Subject: Statistics
Paper – II : Probability Distributions

Time: 3 Hours **Max. Marks: 80**

PART – A

Note: Answer any eight questions. **(8 x 4 = 32 Marks)**

1. Suppose that the half of the population of a town are consumers of rice. 100 investigators are appointed to find out its truth. Each investigator interviewed 10 individuals. How many investigators do you expect to report 3 or less of the people interviewed are consumers of rice?
2. Between the hours of 2 PM and 4 PM the average number of phone calls per minute coming into the switch board of a company is 15. Find the probability that during:
   (i) One particular minute there will be no phone call at all and
   (ii) There will be 5 phone calls?
3. Draw the Poisson probability graph and write the properties of the curve?
4. If the probability that an applicant for a driver's license will pass road test on any given trial is 0.8, what is the probability that he will finally pass the test fewer than 4 trails?
5. If the probability of success on each trail is 0.25, after how many trials can we expect first success?
6. Was there be any inter-relationship between Binomial, Negative-Binomial and Geometric probabilities? Discuss in detail.
7. The mean and variance of a rectangular variate are 1.5 and 0.75 respectively. Obtain the quartiles and hence find Quartile deviation.
8. The mean and variance of a Uniform variable X are 1 and 4/3. Find the parameters and median of X?
9. Write the characteristics of Normal distribution?
10. Write any four applications on the usage of Beta distribution of second kind?
11. If X follows exponential distribution with $P[X \le 1] = P[X > 1]$ find the mean and variance of the random variable?
12. In a transmission line, there is a fault in the insulation for every 2.5 miles on the average. What is the probability of having 2 faults in less than 6 miles?

PART – B

Note: Answer all the questions. **(4 x 12 = 48 Marks)**

13. (a) (i) Stating the physical conditions of Binomial, how can you transform it to a Poisson distribution? Show it.
    (ii) Derive the probability and Moment generating functions of Poisson distribution?

(OR)

(b) Derive the first central moments of Binomial distribution and evaluate its Skewness and kurtosis.

14. (a) Derive the Moment Generating function of Negative Binomial distribution and from it obtain the first four non-central and central moments?

(OR)

(b) Examine if there exists any relationship between a Bernoulli trail and the distributions Negative binomial, Geometric, Binomial, Poisson and Hyper-geometric? Discuss in detail?

15. (a) Show that for a normal distribution QD: MD: SD are in the ratio 10 :12 : 15 ?

(OR)

(b) Approximate the Normal distribution from the limiting Binomial distribution?

16. (a) Draw the Gamma distribution (single and two parameters) curve (s) and state their properties? Also write any four real time applications of Gamma Distribution?

(OR)

(b) Compute the first four central moments of Exponential distribution with parameter θ. Write its statistical significance.

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Code No: E-10105

FACULTY OF SCIENCE

B.A. / B.Sc. (CBCS) II Semester (Regular / Backlog) Examination, June / July 2023

Subject: Mathematics

Paper – II: Differential Equations

Time: 3 Hours **Max. Marks: 80**

PART – A

Note: Answer any eight questions. **(8 x 4 = 32 Marks)**

1. Solve $y - x\frac{dy}{dx} = a\left(y^2 + \frac{dy}{dx}\right)$.
2. Solve $(1+x)\frac{dy}{dx} - xy = 1 - x$.
3. Solve $\frac{dy}{z^2y} = \frac{dy}{z^2x} = \frac{dz}{y^2x}$.
4. Solve $(p+y+x)(xp+y+x)(p+2x) = 0$.
5. Solve $y = yp^2 + 2px$.
6. Solve $(y - px)(p-1) = p$.
7. Solve $\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} - 6\frac{dy}{dx} = 0$.
8. Solve $(D^2 - 4)y = x^2$.
9. Solve $(D^2 - 3D + 2) = 2x^2 + 3e^{2x}$ by using the method of undetermined coefficients.
10. Given that $y = x$ is a solution $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0, x \neq 0$. Then find the general solution of $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x$.
11. Explain Legendre's linear equation.
12. Form a partial differential equation by eliminating the constants h, k from $(x-h)^2 + (y-k)^2 + z^2 = c^2$.

PART – B

Note: Answer all the questions. **(4 x 12 = 48 Marks)**

13. a) Solve $(1-x^2)\frac{dy}{dx} + 2xy = x(1-x^2)^{1/2}$

(OR)

b) Solve $\frac{dx}{x(y^2-z^2)} = \frac{dy}{-y(z^2+x^2)} - \frac{dz}{z(x^2+y^2)}$

14. a) Reduce $xyp^2 - (x^2+y^2+1)p + xy = 0$ to clairaut's form and find its singular solution.

(OR)

b) Bacteria in a certain culture increase at a rate proportional to the number present. If the number doubles in one hour, how long it takes for the number to triple?

15. a) Solve $(D^2 - 4D + 4)y = 8(x^2 + e^{2x} + sin2x)$.

(OR)

b) Solve $\frac{d^2y}{dx^2} + \frac{2dy}{dx} + y = x\cos x$.

16. a) Solve $x^2D^2y - xDy - 3y = x^2 logx$

(OR)

b) Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.

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Code No. D-7555

FACULTY OF SCIENCE

B.A. / B.Sc. (CBCS) II – Semester (Backlog) Examination, June / July 2022

Subject: Mathematics
Paper-II: Differential Equations

Time: 3 Hours **Max. Marks: 80**

PART – A

Note: Answer any five questions. **(5 x 4 = 20 Marks)**

1. Solve $(Sin\, x\, Cos\, y + e^{2x})dx + (Cos\, x\, Sin\, y + tan\, y)\, dy = 0.$
2. Solve $x^2p^2 + xyp - 6y^2 = 0.$
3. Solve $y'' - 3y' + 2y = 0\ if\ y = 0\ and\ \frac{dy}{dx} = 0\ at\ x = 0$
4. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 5.$
5. If the particular integral of
   $(D^2 + 4D + 4)y = 4x^2 + 6e^x\ is$
   $y_p = Ax^2 + Bx + C + De^x\ then\ find\ A, B, C\ \&\ D.$
6. Solve $x^2y'' - xy' + y = 0$ given $y_1 = x$ as a solution.
7. Solve $p^2 + q^2 = m^2.$
8. Solve $p(1 + q) = qz.$

PART – B

Note: Answer all the questions. **(4 x 15 = 60 Marks)**

9. a) Solve $\frac{dx}{x(y^2 - z^2)} = \frac{dy}{-y(z^2 + x^2)} = \frac{dz}{z(x^2 + y^2)}.$

(OR)

b) Solve $y = -px + x^4p^2.$

10. a) Solve $(D^2 + 4D - 12)\, y = (x - 1)e^{2x}.$

(OR)

b) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x\sin x.$

11. a) Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 4y = x^2.$

(OR)

b) Solve $D^2 - 3D + 2)y = sin\, e^{-x}$ variation of parameters.

12. a) Solve $(x^2 - y^2 - z^2)\, p + 2xyq = 2xz.$

(OR)

b) Integrate $\frac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + Sin(2x - y) = 0.$

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Code No. D-6206

FACULTY OF SCIENCE

B.A. / B.Sc. (CBCS) II - Semester (Regular & Backlog) Examination, June / July 2022

Subject: Statistics (Probability Distributions)

Paper – II

Time: 3 Hours **Max. Marks: 80**

PART – A

Note: Answer any eight questions. **(8 x 4 = 32 Marks)**

1. Write short notes on Bernoulli distribution.
2. State and prove reproductive property of Binomial distribution.
3. Define Poisson distribution and obtain its mean.
4. Obtain the recurrence relation for the probabilities of Negative binomial distribution.
5. State and prove lack of memory property of Geometric distribution.
6. Show that Hyper Geometric distribution tends to binomial distribution.
7. Derive mean deviation about mean of Rectangular distribution.
8. Derive the odd order moments about mean of Normal distribution.
9. State and prove the reproductive property of Normal distribution.
10. Define Beta distribution of second kind. Find its mean and variance.
11. Define the general and standard Cauchy distribution.
12. Write short notes on Central Limit Theorem.

PART – B

Note: Answer all the questions. **(4 x 12 = 48 Marks)**

13. (a) Define Binomial distribution. Obtain its m.g.f. and hence find its mean and variance.

(OR)

(b) Obtain the first four moments of Poisson distribution and derive coefficient of Skewness and Kurtosis.

14. (a) Stating the assumptions show that Poisson distribution is a limiting case of Negative binomial distribution.

(OR)

(b) Define Hyper Geometric distribution. Show that Hyper Geometric distribution tends to Binomial distribution.

15. (a) Define Rectangular distribution and hence find moments and Skewness.

(OR)

(b) Stating the assumptions show that Normal distribution as limiting case of Binomial distribution.

16. (a) Derive the following functions of Exponential distributions.
(i) Moment generating function (m.g.f.)
(ii)Cumulant generating function (c.g.f)
(iii)Characteristic function (c.f.)

(OR)

(b) Define Gamma distribution and obtain its moment generating function and hence find its mean and variance.

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Code No. 9039

FACULTY OF SCIENCE

B.Sc. (CBCS) II – Semester Examination, January 2021

Subject : Mathematics

Paper : II (Differential Equations)

Time : 2 Hours — Max. Marks : 80

Part – A

Note : Answer any Five questions. ***(5x 4 = 20Marks)***

1. Solve $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$

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

3. Solve $\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$

4. Explain the method of solving $y = px + f(p)$ Where $p = \frac{dy}{dx}$

5. Solve $x = y + a \log p$

6. Find the Orthogonal trajectories of $xy = C^2$, C is parameter.

7. Solve $\frac{d^2y}{dx^2} - \frac{3dy}{dx} + 2y = 0$ with $y = 0, x = 0$ and $\frac{dy}{dx} = 0$

8. Solve $\frac{d^3y}{dx^3} + y = e^x$

9. Solve $(D^2 - 3D + 2)y = 3\sin 2x$

10. Solve $(x+3)^2\frac{d^2y}{dx^2} - 4(x+3)\frac{dy}{dx} + 6y = \log(x+3)$

11. Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 2y = x\log x$

12. Solve $(mz - ny)p + (nx - lz)q = ly - mx$

Part – B

Note : Answer any Three questions. ***(3 x 20=60Marks)***

13. Solve $x^2y\,dx - (x^3 + y^3)\,dy = 0$

14. Solve $x^2p^2 + xy\,p - 6y^2 = 0$

15. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 \sin x$

16. Find the orthogonal trajectories of $r = c(1 - \sin\theta)$, c is parameter

...2

17. Apply method of undetermined coefficients to solve $(D^2 + 4D + 4)y = 3xe^{-2x}$

18. Solve $(D^2 - 2D + 5)y = e^{2x} \sin x$

19. Apply method of variation of parameters to Solve $(D^2 - 3D + 2)y = \sin e^{-x}$

20. Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

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Code No. 9040

FACULTY OF SCIENCE
B.Sc. (CBCS) II – Semester Examination, January 2021

Subject : Statistics
(Probability Distributions)
Paper : II

Time : 2 Hours **Max. Marks : 80**

Part – A

Note : Answer any Five questions. ***(5x 4 = 20Marks)***

1 Define uniform distribution. Give two examples

2 on an average, there are 1.8 breakdowns every five working days in major factory equipment at the main ABC Fabricators. Find the probability that there will be less than 2 breakdowns during next five working days.

3 Define Hyper – Geometric distributions. Give two examples.

4 Define Negative Binomial distributions. And hence derive its mean and variance.

5 Define normal distribution. For normal distribution, show that median coincides with mean.

6 X is a normal variate with mean 10 and standard deviation 5. Find probabilities of $a)\ 30 \le x \le 45$ and $b)\ x \ge 45$

7 Define exponential distribution. Find its moment generating function.

8 Define Rectangular distribution. Derive its mean.

Part – B

Note : Answer any Three questions. ***(3 x 20=60Marks)***

9 Derive movement generating function of Binomial distribution and hence derive the first four central central moments.

10 Derive the first four non-central moments of poisson distribution through expectations and hence find first four central moments.

11 State and prove Lack of memory property of Geometric distribution. Also derive its probability generating function.

12 Derive mean and variance of Hyper- Gerometric distribution. Also derive binomial distribution as a limiting case of Hyper – Gerometric distribution.

13 Derive normal probability devsity function as a limiting case of Binomial probability mass function.

14 State the characteristics of normal distribution. Derive its mode.

15 Define Gamma distribution. Derive its moment generating function and hence derive the first four central moments, β_1 *and* β_2

16 i) Derive mean and variance of exponential distribution.

ii) If $X_1, X_2, \ldots, X_n$ are independent random variables having exponential distributions with parameters $\vartheta_i, i = 1, 2, \ldots, n$, , then show that

Z= min $(X_1, X_2, \ldots, X_n)$ has exponential distribution with parameter $\theta = \sum_{i=1}^{n} \theta_1$

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Code No. 9041

FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, January/February 2021

Subject : Computer Science

Paper – II : Programming in C++

Time : 2 Hours **Max. Marks: 80**

PART – A

Answer any five questions. **(5x4=20 Marks)**

1 Describe different data types of C++ with examples.
2 What is Default Argument? Demonstrate with a C++ program?
3 Write down the applications of OOP.
4 What is the difference between a class and an instance of the class?
5 Briefly describe what is meant by member-wise assignment.
6 Explain Binary operator overloading in C++ using friend function.
7 What is the difference between redefining a base class function and overriding a base class function.
8 Discuss formatted I / O operations with advantages and disadvantages.
9 What is an abstract base class?
10 Explain how exception thrown by one function is caught by another function.
11 What is class template? Explain its syntax.
12 Can you overload function templates? Explain.

PART – B

Answer any three questions. **(3x20=60 Marks)**

13 What do you mean by control flow statements? Explain each type with example.

14 What is object oriented programming? How it is different from procedure oriented programming? Explain its advantages.

15 (i) Define and explain default constructor and copy constructor.
(ii) Explain parameterized constructor with suitable example.

16 What are the advantages of operator overloading? Write a C++ program to overload '+' and '=' operator to concatenate two strings and assign one string on another.

17 What is inheritance? With suitable examples discuss various inheritance supported by C++.

18 Explain virtual function and run time polymorphism. Write a program to demonstrate dynamic polymorphism.

19 (i) Explain throwing and catching mechanism with suitable examples.
(ii) What should be placed inside the try block and catch block? When do you use multiple catch handlers?

20 (i) What is function template? Explain the purpose of function templates with suitable examples.
(ii) Write a program to implement a Bubble sort using function templates.

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