**Part – A**
**Model Question Paper**
**Subject Specific**
**Mathematics  -50Marks**

1. A random variable that assume a infinite or a unaccountably infinite number of values is called _____

    a) Continuous random variable

    b) Discrete random variable

    c) Irregular random variable

    d) Uncertain random variable

2. In a discrete probability distribution, the sum of all probabilities is always?

    a) 0
    b) Infinite
    c) 1
    d) Undefined

3. The weight of persons in a state is a _____

    a) Continuous random variable

    b) Discrete random variable

    c) Irregular random variable

    d) Not a random variable

4. Which of the following is true for the coefficient of correlation?

    a) The coefficient of correlation is not dependent on the change of scale

    b) The coefficient of correlation is not dependent on the change of origin

    c) The coefficient of correlation is not dependent on both the change of scale and change of origin

    d) None of the above

5. The angle between Radius vector r=a(1-cos θ)and tangent to the curve is Ø given by

    a) $\emptyset = \pi/2$

    b) $\emptyset = \pi$

    c) $\emptyset = -\pi/2$

    d) $\emptyset = 0$

6. $\begin{pmatrix} 2 & 0 & 0 \\ 1 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is

   a) diagonalizable  b) nilpotent  c) idempotent  d) not diagonalizable

7. Consider the vertical cone. The minimum value of the function in the region $f(x,y) = c$ is?

   a) constant

   b) 1

   c) 0

   d) -1

8. Numerical techniques more commonly involve _____

   b) Elimination method

   c) Reduction method

   d) Iterative method

   e) Direct method

9. What is the divergence and curl of the vector $\vec{} = x^2yi + (3x + y)j + y^3zk$ .

   a) $y^3 + 2xy + 1,\ i\,(3y^2z) + j(3 - x^2)$

   b) $y^3 + 2xy + 1, i\,(3y^2z) + k\,(3 - x^2)$

   c) $3y^3 + 2xy + 1, i\,(3y^2z) + k\,(3 - x^2)$

   d) $y^3 + xy + 1, i\,(3y^2z) + k(3 - x^2)$

10. Solve the following equations by Gauss Elimination Method. $x + 4y - z = -5,\ x + y - 6z = -12,\ 3x - y - z = 4$

   a) $x = 1.64491, y = 1.15085, z = 2.09451$

   b) $x = 1.64691, y = 1.14095, z = 2.08461$

   c) $x = 1.65791, y = 1.14185, z = 2.08441$

   d) $x = 1.64791, y = 1.14085, z = 2.08451$

11. Find the inverse Laplace transform of $\frac{1}{s(s-1)(s^2+1)}$.

   a) $\frac{1}{2} e^{-t} + \frac{1}{2} \text{Sin}(-t) - \frac{1}{2} \text{Cos}(-t)$

   b) $\frac{1}{2} e^{t} + \frac{1}{2} \text{Sin}(t) - \frac{1}{2} \text{Cos}(t)$

   c) $\frac{1}{2} e^{t} + \frac{1}{2} \text{Sin}(t) + \frac{1}{2} \text{Cos}(t)$

   d) $\frac{1}{2} e^{t} - \frac{1}{2} \text{Sin}(t) - \frac{1}{2} \text{Cos}(t)$

12. Evaluate $\int\int xy\, dxdy$ over the region bounded by $x$ axis, ordinate $x = 2a$ and the curve $x^2 = 4ay$.

   a) $\frac{a^4}{3}$

b) $\dfrac{a^4}{6}$

c) $\dfrac{a^3}{3}$

d) $\dfrac{a^2}{3}$

13. Find $x$ if $x_0 = 0.6$, $n = 2.6$ and $h = 0.2$.

   a) 12

   b) 1.2

   c) 1.12

   d) 1.22

14. The reduced form of the Matrix in Gauss Elimination method is also called _____

   a) Column Echelon Form

   b) Row-Column Echelon Form

   c) Column-Row Echelon Form

   d) Row Echelon Form

15. If f(x) is a probability density function of a continuous random variable, then $\int_{-\infty}^{\infty} f(x) = $?

   a) 0

   b) 1

   c) undefined

   d) Insufficient data

16. The variable that assigns a real number value to an event in a sample space is called------

   a) Random variable

   b) Defined variable

   c) Uncertain variable

   d) Static variable

17. If $P(x) = 0.5$ and $x = 4$, then $E(x) = $?

   a) 1

   b) 0.5

   c) 4

   d) 2

18. In random experiment, observations of random variable are classified as _____

   a) Events

   b) Composition

   c) Trials

   d) Functions

19. Which of the following are types of correlation?

    a) Positive and Negative

    b) Simple, Partial and Multiple

    c) Linear and Nonlinear

    d) All of the above

20. If the values of two variables move in the opposite direction, _____

    a) The correlation is said to be linear

    b) The correlation is said to be non-linear

    c) The correlation is said to be positive

    d) The correlation is said to be negative

21. What is the meaning of the testing of the hypothesis?

    a) It is a significant estimation of the problem

    b) It is a rule for acceptance or rejection of the hypothesis of the research problem

    c) It is a method of making a significant statement

    d) None of the above

22. The original hypothesis is known as _____.

    a) Alternate hypothesis

    b) Null hypothesis

    c) Both a and b are incorrect

    d) Both a and b are correct

23. If a square matrix of order 10 has exactly 5 distinct eigen values, then the degree of the minimal polynomial is

    a) at least 5  b) at most 5  c) always 5  d) exactly 10

24. Evaluate $\lim_{x \to 1} x^{\frac{1}{1-x}}$

    a) $k = 1/e$

    b) $k = 1$

    c) $k = e$

    d) $k = 2$

25. $f(x,y) = sin(x).cos(y)$ Which of the following is a critical point?

    a) $(\Pi/4, \Pi/4)$

    b) $(-\Pi/4, \Pi/4)$

    c) $(0, \Pi/2)$

    d) $(0, 0)$

26. $A^2 - A = 0$, where $A$ is a $9 \times 9$ matrix. Then

    a) A must be a zero matrix      b) A is an identity matrix

    c) Rank of A is 1 or 0        d) A is diagonalizable

27. What is the value of $\beta(3,2)$?

    a) 114

    b) 116

    c) 112

    d) 110

28. Which of the following statements is true about the null hypothesis?

    a)  Any wrong decision related to the null hypothesis results in two types of errors

    b)  Any wrong decision related to the null hypothesis results in one type of an error

    c)  Any wrong decision related to the null hypothesis results in four types of errors

    d)  Any wrong decision related to the null hypothesis results in three types of errors

29. The independent variable is used to explain the dependent variable in _____.

    a)  Linear regression analysis

    b)  Multiple regression analysis

    c)  Non-linear regression analysis

    d)  None of the above

30. Which of the following is an example for first order linear partial differential equation?

    a) Lagrange's Partial Differential Equation

    b) Clairaut's Partial Differential Equation

    c) One-dimensional Wave Equation

    d) One-dimensional Heat Equation

31. What is another name for heat equation?

    a) Induction equation

    b) Condenser equation

    c) Diffusion equation

    d) Solar equation

32. Who discovered the one-dimensional wave equation?

    a) Jean d'Alembert

    b) Joseph Fourier

    c) Robert Boyle

    d) Isaac Newton

33. In which of the following fields, does the wave equation not appear?

   a) Acoustics

   b) Electromagnetics

   c) Pedology

   d) Fluid Dynamics

34. Which of the following is the condition for a second order partial differential equation to be hyperbolic?

   a) $b^2$-ac<0

   b) $b^2$-ac=0

   c) $b^2$-ac>0

   d) $b^2$-ac=<0

35. A collision occurs when two bodies moving at the same speed collide. Which of the following quantities has not been lost?

   e) Momentum

   f) Speed

   g) Force

   h) Velocity

36. What assumptions do we make when a body collides with a wall or the ground?

   a)   The body has a significant mass

   b)   The body is stationary

   c)   When compared to the mass of the wall or the ground, the body's mass is insignificant.

   d)   The body is perfect

37. Which of the following statements is true about the regression line?

   a)   A regression line is also known as the line of the average relationship

   b)   A regression line is also known as the estimating equation

   c)   A regression line is also known as the prediction equation

   d)   All of the above

38. Take Laplace Transformation on the Ordinary Differential Equation if $x'' - 2x' + x = e^{2t}$ with $x(0) = 0, \ x'(0) = -1$.

   a) $e^{2t} - (1 + 2t)e^t$

   b) $e^{2t} - (1 - t)e^t$

   c) $e^{2t} - (1 + 2t)e^t$

   d) $e^{2t} - (1 - 2t)e^t$

39. Find $\lim_{x\to-2} 2(\sin(x-2)^2(x+2)^2)$

    a) 1

    b) 0

    c) $\infty$

    d) $\frac{0}{0}$

40. Find the polynomial for the following data.

| x | 4 | 6 | 8 | 10 |
|---|---|---|---|----|
| f(x) | 1 | 3 | 8 | 16 |

    a) $\frac{3x^2-22x+368}{8}$

    b) $3x^2 - 22x + 36$

    c) $\frac{3x^2+22x+362}{2}$

    d) $\frac{3x^2-19x+368}{8}$

41. In which of the following both sides of equation are multiplied by non-zero constant?

    a) Gauss Elimination Method

    b) Gaussian Inconsistent procedure

    c) Gaussian consistent procedure

    d) Gaussian substitute procedure

42. Apply Gauss Elimination method to solve the following equations. x + 4y – z = -5, x + y – 6z = -12, 3x – y – z = 4

    a) x = 1.6479, y = -1.1408, z = 2.0845

    b) x = 4.0461, y = -1.1408, z = 3.254

    c) x = 7.2478, y = -2.586, z = 8.265

    d) x = 2.8471, y = 5.5123, z = 2.0845

43. What is the new mass of a body with an initial mass of 10 kg moving at a velocity of 7 m/s for a short time before increasing to 14 m/s? If the body is moving without any external force?

    a) 2.5 Kg

    b) 5 Kg

    c) 7.5 Kg

    d) 10 Kg

44. Which of the following mentioned standard Probability density functions is applicable to discrete Random Variables?

    a) Gaussian Distribution

    b) Poisson Distribution

    c) Rayleigh Distribution

    d) Exponential Distribution

45. What is the area under a conditional Cumulative density function?

    a) 0                      b) Infinity

    c) 1                      d) Changes with CDF

46. When do the conditional density functions get converted into the marginally density functions?

    a) Only if random variables exhibit statistical dependency

    b) Only if random variables exhibit statistical independency

    c) Only if random variables exhibit deviation from its mean value

    d) If random variables do not exhibit deviation from its mean value

47. Mutually Exclusive events _____

    a) Contain all sample points

    b) Contain all common sample points

    c) Does not contain any sample point

    d) Does not contain any common sample point

48. What would be the probability of an event 'G' if H denotes its complement, according to the axioms of probability?

    a) $P(G) = 1 / P(H)$             b) $P(G) = 1 - P(H)$

    c) $P(G) = 1 + P(H)$            d) $P(G) = P(H)$

49. A table with all possible value of a random variable and its corresponding probabilities is called _____

    a) Probability Mass Function             b) Probability Density Function

    c) Cumulative distribution function       d) Probability Distribution

50. A variable that can assume any value between two given points is called _____

    a) Continuous random variable

    b) Discrete random variable

    c) Irregular random variable

    d) Uncertain random variable

## General Aptitude Entrance Test Question paper for Ph.D- 30 marks
## Common to all branches

1) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

    (A) 720                (B) 520

    (C) 420                (D) 630

2) There are 7 non-collinear points. How many triangles can be drawn by joining these points?

    (A) 45                (B) 85

    (C) 35                (D) 25

3) A is 3 years older to B and 3 years younger to C, while B and D are twins. How many years older is C and D?

    (A) 7                (B) 5

    (C) 6                (D) 8

4) The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms in 4 hours, then the speed of the first train is:

    (A) 78.5 km/hr         (B) 52 km/hr

    (C) 60 km/hr           (D) 87.5 km/hr

5) Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

    (A) 4:5                (B) 5:4

    (C) 6:5                (D) 2:5

6) Three unbiased coins are tossed. What is the probability of getting at most two heads?

    (A) 5/7                (B) 5/4

    (C) 7/8                (D) 3/6

7) If an angle is its own complementary angle, then its measure is

    (A) $45^0$               (B) $55^0$

    (C) $60^0$              (D) $70^0$

8) The digit in unit's place of the product

    (A) 2                                       (B) 1

    (C) 0                                       (D) 4

9) When he

    P : did not know

    Q : he was nervous and

    R : heard the hue and cry at midnight

    S : what to do

The Proper sequence should be:

    (A) RQPS                            (B) PQRS

    (C) SPQR                            (D) QPRS

10) Correct the sentence "He was very tired as <u>he is working</u> since 6'0 clock in the morning".

    (A) he was working              (B ) he had been working

    (C) he has been working        (D) he will be working

11) Pain: sedative

    (A) Day: Night                    (B) Dengue: Mosquito

    (C) Malaria: Water              (D) Grief: Consolation

12) Find the missing term of the given expression: $18.834 + 818.34 - ? = 618.43$

    (A) 217.644                      (B) 218.744

    (C) 217.744                      (D) 217.844

13) The amount of uncertainty in a system of the symbol is called.

    (A) bandwidth                    (B) Entropy

    (C) loss                               (D) quantum

14) Buffering is….

    (A) The process of temporarily storing the data to allow for small variation in device speeds.

    (B) A method to reduce cross-talks

    (C) Storage of data within the transmitting medium until the receiver is ready to receive

    (D) A method to reduce the routing overhead

15) What is the name of the virus that fool a user into downloading and executing them by pretending to be   useful applications?

    (A) Trojan Horses                 (B) keylogger

    (C) worm                              (D) ransomware

16) Which among the following is NOT a web browser?

    (A) SpaceTim

    (B) NeoPlanet

    (C) Sputnik

    (D) MeeGo

17) Which of the following comprise the software components of a computer?

    (A) Programs

    (B) Keyboard

    (C) BIOS

    (D) Memory

18) Which of the following are the features of a Spreadsheet?

    (A) Layers an Lines             (B) Rows and Columns

    (C) Layers and Planes          (D) Height and Width

19) Which of these IEEE standards represent wireless local area network?

    (A) 802.11                      (B) 802.3

    (C) 802.12                     (D) 802.1

20) Which of these protocols is used by TFTP for data transport?

    (A) TCP                            (B) UDP

    (C) Both A&B                   (D) None of the Above

21) The last Sunday of March, 2006 fell on which date?

    Statements:

        I. The first Sunday of that month fell on 5th.

        II. The last day of that month was Friday.

        (A) I alone is sufficient while II alone is not sufficient

        (B) II alone is sufficient while I alone is not sufficient

        (C) Either I or II is sufficient

        (D) Neither I nor II is sufficient

22) Five persons - A, B, C, D and E are sitting in a row. Who is sitting in the middle?

    Statements:

    I. B is between E and C.

    II. B is to the right of E

    III. D is between A and E.

    (A) Only I and II

    (B) Only II and III

    (C) Only I and III

    (D) All I, II and III

23) All the trees in the park are flowering trees. Some of the trees in the park are dogwoods. All dogwoods in the park are flowering trees. If the first two statements are true, the third statement is

    (A) True

    (B) False

    (C) Uncertain

    (D) None of the above

24) 5 : 150 :: 8 : ___

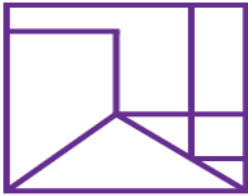    (A) 576                         (B) 567

    (C) 512                         (D) 520

25) Find the number of parallelograms.
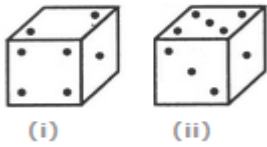


    (A) 8

    (B) 10

    (C) 15

    (D) None of These

26) How many triangles are there in the following figure?
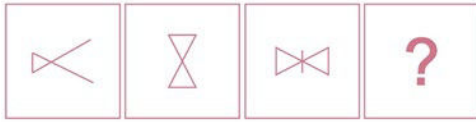


    (A) 2

    (B) 3

    (C) 4

    (D) More than 4

27) Two positions of a cube are shown below. When the number 4 will be at the bottom, then which number will be at the top?
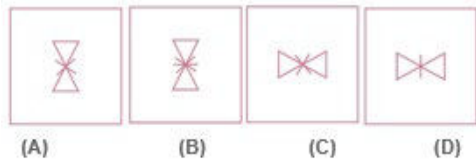


    (i)    (ii)

    (A) 3           (B) 5

    (C) 6           (D) None of these

28) Questions Figures



Answer figures



(A)          (B)          (C)          (D)

(A) A

(B) C

(C) D

(D) B


29) A man is facing west. He turns 45 degrees in the clockwise direction and then another 180 degrees in the same direction and then 270 degrees in the anticlockwise direction. Find which direction he is facing now?

(A) South

(B) West

(C) South West

(D) East


30) Statement 1: Pens cost more than pencils. Statement 2: Pens cost less than erasers.

Statement 3: Erasers cost more than pencils and pens. If the first two statements are true, the third Statement is

(A) True

(B) False

(C) Uncertain

(D) Cannot be determined

## Mathematics Entrance Test Question paper for Ph.D- 20 Marks
### Common to all branches

1. For the linear transformation, $X = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 2 \\ 1 & 0 & -2 \end{bmatrix} Y$, find the Y co-ordinates for (1, 2, -1) in X.

   a) (0, -2, 0)

   b) (-1, 3, 1)

   c) (-1, -2, 0)

   d) (-1, 3, 0)

2. Which of the following statements is true about the regression line?

   a) A regression line is also known as the line of the average relationship

   b) A regression line is also known as the estimating equation

   c) A regression line is also known as the prediction equation

   d) All of the above

3. If the values of two variables move in the same direction, _____

   a) The correlation is said to be non-linear

   b) The correlation is said to be linear

   c) The correlation is said to be negative

   d) The correlation is said to be positive

4. Which of the following are types of correlation?

   a) Positive and Negative

   b) Simple, Partial and Multiple

   c) Linear and Nonlinear

   d) All of the above

5. A is $5 \times 5$ matrix, all of whose entries are 1, then

   a) A is not diagonalizable

   b) A is idempotent

   c) A is nilpotent

   d) The minimal polynomial and the characteristics polynomial of A are not equal.

6. $T : R^3 \to R^3$ such that $T(a, b, c) = (0, a, b)$, for $(a, b, c) \in R^3$. Then $T + I$ is a zero of the polynomial:

   a) $t$

   b) $t^2$

   c) $t^3$

   d) None of above

7. $T: P_2(R) \to P_3(R)$ such that $T(f(x)) = 2f'(x) + 3\int_0^x f(t)dt$. Then rank of T is

    a) 1          b) 2          c) 3          d) 4

8. The minimal polynomial of $\begin{pmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$ is

    a) $(x - 2)$

    b) $(x - 2)(x - 5)$

    c) $(x - 2)^2(x - 5)$

    d) $(x - 2)^3(x - 5)$

9. Number of linearly independent Eigen vectors of $\begin{pmatrix} 2 & 2 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 1 & 4 \end{pmatrix}$ is

    a) 1      b) 2      c) 3      d) 4

10. A is a 4-square matrix and $A^5 = 0$. Then

    a) $A^4 = I$      b) $A^4 = A$      c) $A^4 = 0$      d) $A^4 = -I$

11. Solve the following equations by Gauss Elimination Method.

x+4y-z = -5,   x+y-6z = -12,   3x-y-z = 4

    a)  x = 1.64791, y = 1.14085, z = 2.08451

    b)  x = 1.65791, y = 1.14185, z = 2.08441

    c)  x = 1.64691, y = 1.14095, z = 2.08461

    d)  x = 1.64491, y = 1.15085, z = 2.09451

12. Find the values of x, y, z in the following system of equations by gauss Elimination Method. $2x + y - 3z = -10$, $-2y + z = -2$, $z = 6$

    a)  2, 4, 6

    b)  2, 7, 6

    c)  3, 4, 6

    d)  2, 4, 5

13. In Gauss Jordan method which of the following transformations are allowed?

    a) Diagonal transformation

    b) Column transformation

    c) Row transformation

    d) Square transformation

14. Solve the equations using Gauss Jordan method.

$x + 2y + 6z = 15, \ 3x + 4y + z = 16, \ 6x - y - z = 20$

    a) $x = 3.735, y = 0.795, z = 1.612$

    b) $x = 3.735, y = 3.735, z = 1.612$

    c) $x = 3.735, y = 1.612, z = 3.735$

    d) $x = 1.612, y = 0.795, z = 3.735$

15. Gauss Seidal method is also termed as a method of _____

    a) Successive displacement

    b) Eliminations

    c) False positions

    d) Iterations

16. Which of the following is not Dirichlet's condition for the Fourier series expansion?

    a) f(x) is periodic, single valued, finite

    b) f(x) has finite number of discontinuities in only one period

    c) f(x) has finite number of maxima and minima

    d) f(x) is a periodic, single valued, finite

17. If the function f(x) is odd, then which of the only coefficient is present?

    a) $a_n$

    b) $b_n$

    c) $a_0$

    d) Everything is present

18. Find $b_n$ if the function $f(x) = x^2$.

    a) finite value

    b) infinite value

    c) zero

    d) can't be found

19. What is the coefficient of $x^{101729}$ in the series expansion of $\cos(\sin(x))$?

    a) 0      b) $1/101729!$      c) $-1/101729!$      d) 1

20. The angle between Radius vector r=a(1-cos θ)and tangent to the curve is Ø given by _____

    a) Ø=π/ 2      b) Ø=π      c) Ø=−π/2      d) Ø=0