Exam Name : HNGU_PHD_Mathematics_31.01.2024_12.00 PM TO 02:00 PM
Exam Date : 2024-01-31
Exam Time : 12:00:00 PM To 02:00:00 PM
Total Marks : 100

Note : The correct answer is indicated by the green color. સાચો જવાબ લીલા રંગ દ્વારા સૂચવવામાં આવે છે.

Question List:

Section: Section-A

- **What is the first stage of the research process? [1 Mark]**

    - Collect and analyse the data
    - Develop and implement the research plan
    - Report the findings
    - **Define the research problem**

- **Qualitative approach of research is not concerned with [1 Mark]**

    - Subjective assessment of attitudes
    - Opinions and behaviour
    - Subjective assessment of attitudes, opinions and behaviour
    - **None of these**

- **A Type I error can occur when the null hypothesis is [1 Mark]**

    - **rejected**
    - accepted
    - Depends upon the population
    - None of these

- **A hypothesis is a [1 Mark]**

    - Law
    - Postulate
    - **Supposition**
    - Canon

- **One of the importance of providing reference in your academic assignment is [1 Mark]**

    - to show that your ideas are worthy
    - **to distinguish your ideas from others**
    - to persuade the readers
    - None of these

- **A review that only demonstrates familiarity with an area is rarely published but it often is part of an educational program is which type of review? [1 Mark]**

- - Integrative reviews
    - Theoretical reviews
    - **Self-study reviews**
    - Historical reviews

- **A research focuses on statistical analysis of numerical data collected through the use of large-scale, survey research, using methods such as questionnaire or structured interview is known as [1 Mark]**

    - Fundamental research
    - **Quantitative research**
    - Applied research
    - Qualitative research

- **Illegal use of someone's work without proper citations is known as [1 Mark]**

    - **Plagiarizing**
    - Cheating
    - Citing
    - Referencing

- **The purpose of simple linear regression analysis is to: [1 Mark]**

    - Replace points on a scatter diagram by a straight line
    - Obtain the expected value of the independent random variable for a given value of the dependent variable
    - **Obtain the expected value of the independent random variable for a given value of the dependent variable**
    - None of these

- **Which of the following is another term for a Hypothesis Test? [1 Mark]**

    - Level of significance
    - Test statistic
    - **Test of significance**
    - No tailed test

- **In a thesis, figures and tables are included in [1 Mark]**

    - Separate chapter
    - The concluding chapter
    - The text itself
    - **Appendix**

- **How do you find degrees of freedom for a chi-square goodness of fit test? [1 Mark]**

    - **One less than the sample size**
    - One less than the population
    - Half of total sample size
    - Twice the total sample size

- **Scientific writing should be [1 Mark]**

    - Clear
    - Brief
    - Concise
    - **All of these**

- **Which of the following section is NOT the part of the Research Proposal? [1 Mark]**

    - Introduction
    - **Data Analysis**
    - Literature review
    - References

- **What is the standard font size for the research paper? [1 Mark]**

    - 11
    - 14
    - **12**

- 16

- **What is the range of possible values for the correlation coefficient? [1 Mark]**

    - 0 to 1
    - -1 to 0
    - -10 to 10
    - **-10 to 10**

- **Two major types of Descriptive research are [1 Mark]**

    - Observation method and decisional method
    - **Observation method and survey method**
    - Survey method and theoretical method
    - None of these

- **When citing a journal article, what is the format for the volume, issue, and pages number? [1 Mark]**

    - **Volume No. (Issue No.) Pages No.**
    - Volume No., Issue No., Pages No.
    - (Volume No.) Issue No., Pages No
    - Volume No., Issue No. (Pages No.)

- **What is an appropriate rule for writing three or more than three authors in research paper? [1 Mark]**

    - Lead author's name, comma, etc.
    - Lead author's name, comma, n.d.
    - **Lead author's name, comma, et al.**
    - Lead author's name, comma, ed.

- **Which punctuation is used to separate the information in a bibliography entry? [1 Mark]**

    - Comma
    - Exclamation point
    - Quotation mark
    - **Period**

- **What is the purpose of the thesis? [1 Mark]**

    - To remind your reader what is your paper is about
    - To hook the reader's attention
    - **To state your opinion or claim and prove it**
    - To use vocabulary words

- **Choose the pair that best represents a similar relationship to the one expressed in the original pair of words EXPLORE : DISCOVER [1 Mark]**

    - read : skim
    - **research : learn**
    - write : print
    - think : relate

- **Which of the following is found necessarily in milk? [1 Mark]**

    - Cream
    - Curd
    - Water
    - **Whiteness**

- **image [1 Mark]**

  In the following figure triangle represents 'girls', square players and circle-coach. Which part of the diagram represents the girls who are player but not coach?
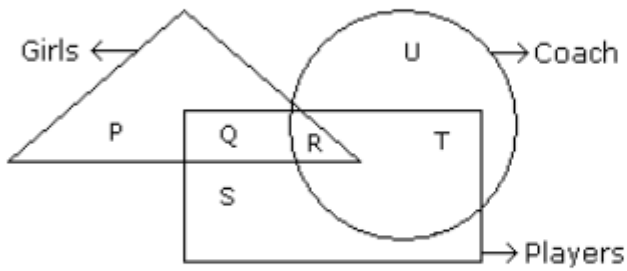
  a. P
  b. Q
  c. R
  d. S

  - A
  - **B**
  - C
  - D

- **What is the maximum number of pieces that a pizza can be cut into by 7 knife cuts? [1 Mark]**

  - 21
  - 42
  - 14
  - **29**

- **A paragraph is a group of [1 Mark]**

  - Words arranged in logical sequence
  - **Sentences arranged in a logical sequence**
  - Sentences arrange in any random order
  - Words arranged without logical sequence

- **Dwarfish is a better word for [1 Mark]**

  - Huge
  - **Small**
  - Tall
  - None of these

- **If today is Monday, then after 61 days the day will be [1 Mark]**

  - Tuesday
  - Thursday
  - **Saturday**
  - Friday

- **Image [1 Mark]**

Find the missing number

6	9	15
8	12	20
4	6	?

a. 20
b. 10
c. 15
d. 25

- A
- **B**
- C
- D

- **Which of the following are examples of search engines? [1 Mark]**

- Word and Excel
- Internet explorer and Firefox
- **Yahoo and Google**
- Word and PowerPoint

- **What type of computer has a main purpose of serving other computers on a LAN? [1 Mark]**

- Client
- **Server**
- Computer
- Microcomputer

- **What does every formula in MS EXCEL to start with? [1 Mark]**

- +
- –
- *
- **=**

- **Text editors are programs that help us to [1 Mark]**

- **Write & edit**
- Listen to music
- Draw a picture
- Play a game

- **In MS word, Tables, shapes, images, charts, graphs, header, etc. They are included in the _____ category [1 Mark]**

- Review
- Home
- **Insert**
- Page Layout

- **The child responded to his mother's demands _____ throwing a tantrum. [1 Mark]**

- with
- **by**
- from
- in

- **Choose the correct form for Passive Voice "They make shoes in that factory" [1 Mark]**

- Shoes will be made in that factory

- Shoes were made in that factory
- **Shoes are made in that factory**
- Shoes are make in that factory

- **Which of the following practices is an effective way to avoid plagiarism in research [1 Mark]**

  - **Appropriately citing the sources of all quotations, ideas, or data taken from others**
  - Directly copying and pasting text from an online article without citations
  - Paraphrasing text heavily from an original source without giving credit
  - Citing only direct quotations but not ideas that have been paraphrased

- **If the population variance is unknown and the sample size is small, then which test is applicable? [1 Mark]**

  - **t-test**
  - z-test
  - chi-test
  - None of these

- **Why do we randomly select our samples? [1 Mark]**

  - to increase bias
  - **to reduce bias**
  - because it's easier
  - None of these

- **Which of the following is a small portion of the population used to gather data [1 Mark]**

  - Bias
  - Systematic Sampling Method
  - **Sample**
  - Population

- **In what kind of research, the researcher has to use facts or information already available [1 Mark]**

  - **Analytical research**
  - Descriptive research
  - Applied research
  - Distinctive research

- **A Blue print of Research work is known a [1 Mark]**

  - Sampling design
  - **Research design**
  - Research hypotheses
  - Research approach

- **Title of the thesis must be the same as [1 Mark]**

  - **The title of your synopsis**
  - The title of your research paper
  - Any of previous work in the same field
  - Any of the previous work in another field

- **The random error can be assessed [1 Mark]**

  - Empirically
  - **Statistically**
  - Experimentally
  - By performing sensitivity analysis

- **The hypothesis that two groups are the same [1 Mark]**

  - Alternative hypothesis
  - Experimental hypothesis
  - Statistical hypothesis
  - **Null hypothesis**

- **In how many phases the transaction executed in the validation-based protocol? [1 Mark]**

- 1
- 2
- **3**
- 4

- **If the correlation coefficient is 0, then what we can say [1 Mark]**

    - **No linear relationship**
    - Weak positive correlation
    - Perfect negative correlation
    - Linear relationship

- **The correlation between time and speed is [1 Mark]**

    - Positive
    - **Negative**
    - Zero
    - Mixed

- **Simple linear regression requires that the scales of measurement be expressed in either [1 Mark]**

    - Nominal or ordinal
    - Ordinal or ratio
    - **Interval or ratio**
    - Nominal or interval

- **The z-test 50.is applicable when sample size is greater than [1 Mark]**

    - 20
    - 10
    - 100
    - **30**

Section: Section-B

- **Question [1 Mark]**

    Consider the following statements:

    (i) S be the set of all straight line in a plane each

    (ii) of which passes through at least two different rational co-ordinates

    (iii) The set $\{\log x,\ x > 0\}$ Then

    a) (i) is countable, but (ii) is uncountable

    b) (i) and (ii) are both countable

    c) (ii) is countable, but (i) is not countable

    d) (i) and (ii) are both uncountable

    - **A**
    - B
    - C
    - D

- **Question [1 Mark]**

    Limit superior of $\left\{\dfrac{(-1)^n}{3^n}\right\}$ is

    a) 0

    b) $\dfrac{1}{9}$

    c) $\dfrac{1}{3}$

    d) None of these

- **Question [1 Mark]**

Which of the following is true?
a) The set of rational number is not lebesgue measurable
b) Intersection of two lebesgue measurable set is not lebesgue measurable
c) The set of rational number have lebesgue outer measure equal to one
d) The set of rational number is lebesgue measurable

- A
- B
- C
- **D**

- **Question [1 Mark]**

Let $f(x) = \begin{cases} 1 - x, & x \in [0,1] \cap Q^c \\ x, & x \in [0,1] \cap Q \end{cases}$. Then

a) $f(x)$ is Riemann integrable on $[0,1]$
b) $f(x)$ is continuous at more than one point
c) $f(x)$ is Riemann integrable on $[0,1]$
d) $f(x)$ is continuous exactly at three points

- A
- B
- **C**
- D

- **Question [1 Mark]**

The function $f(x) = 1 - |x - 1|$ on $\mathbb{R}$ is
a) Not continuous
b) Continuous but not differentiable
c) Differentiable only at one point
d) Differentiable but not continuous

- A
- **B**
- C
- D

- **Question [1 Mark]**

Which of the following is true?
a) A subset $S \subset \mathbb{R}^n$ is compact iff S is closed and bounded
b) A subset $S \subset \mathbb{R}^n$ is compact iff every open cover of S has infinite sub cover of S
c) If S_1 and S_2 are compact set, then $S_1 \times S_2$ need not be compact
d) None of these

  - **A**
  - B
  - C
  - D

- **Question [1 Mark]**

The rank of the 4×4 skew- symmetric matrix
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \\ -1 & 0 & -1 & 0 \end{bmatrix} \text{ is}$$
a) 2
b) 1
c) 4
d) 3

  - A
  - B
  - **C**
  - D

- **Question [1 Mark]**

The dimension of the vector space of all 3×3 real symmetric matrices is
a) 3
b) 9
c) 4
d) 6

  - A
  - B
  - C
  - **D**

- **Question [1 Mark]**

Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statement implies that T is one-one and onto:
a) Nullity $(T) = n$
b) Rank $(T) = n$
c) Rank $(T) +$ Nullity $(T) = n$
d) Rank $(T) <$ Nullity (T)

  - A
  - **B**

- C
- D

- **Question [1 Mark]**

  If $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ is eigenvector of $A = \begin{bmatrix} 1 & -1 \\ -3 & n \end{bmatrix}$, then n is

  a) -2
  b) -1
  c) -3
  d) None of the above

    - A
    - **B**
    - C
    - D

- **Question [1 Mark]**

  A real quadratic forms $X^T A X$ is positive definite, if
  a) All eigen values of $A > 0$
  b) All eigen values of $A < 0$
  c) All eigen values of $A = 0$
  d) None of the above

    - **A**
    - B
    - C
    - D

- **Question [1 Mark]**

  In Markov chain, which of the following is a characteristic of an initial state vector?
  a) The probabilities add up to 1
  b) It is a not a row vector
  c) Both a and b
  d) Neither a nor b

    - **A**
    - B
    - C
    - D

- **Question [1 Mark]**

  If $f(z) = u(x, y) + i\, xy$ is analytic, then
  a) $u(x, y) = x^2 - y^2$
  b) $u(x, y) = \dfrac{x^2 + y^2}{2}$
  c) $u(x, y) = \dfrac{x^2 - y^2}{2}$
  d) $u(x, y) = x^2 + y^2$

    - A
    - B
    - **C**

- D

- **Question [1 Mark]**

The value of $\int_{|z+1|=2} \frac{z}{4-z^2} \, dz$

a) 0

b) πi

c) 1

d) $-\pi i$

  - A
  - B
  - C
  - **D**

- **Question [1 Mark]**

Which of the following is true?

a) If f is analytic function in domain D, then $|f|$ does not attains its maximum value in D unless it is constant

b) If f is analytic function in domain D, then $|f|$ attains its maximum value in D

c) If f is analytic function in domain D and continuous on ∂D, then maximum value of $|f|$ attains on ∂D or inside D.

d) None of these

  - **A**
  - B
  - C
  - D

- **Question [1 Mark]**

The non-constant transformation $w = \bar{z}$ is

a) Both isogonal and conformal

b) Isogonal but not conformal

c) Conformal but not isogonal

d) Neither isogonal nor conformal

  - A
  - **B**
  - C
  - D

- **Question [1 Mark]**

The Euler's $\emptyset$ −function $\emptyset(n)$ is

a) One-one

b) Onto

c) Both one-one and onto

d) Neither one-one nor onto

  - A
  - B
  - C
  - **D**

- **Question [1 Mark]**

  Which of the following is not correct?
  a) $(P(\mathbb{N}), \triangle)$ power set of natural number under symmetric difference is an abelian group
  b) $GL(n, \mathbb{F})$ the group of $n \times n$ matrices with non-zero determinant with entries from field $\mathbb{F}$ under matrix multiplication is non-abelian group
  c) $SL(n, \mathbb{F})$ the group of $n \times n$ matrices with determinant 1 with entries from field $\mathbb{F}$ under matrix multiplication is an abelian group
  d) $(\mathbb{R}, +)$ is an abelian group

    - A
    - B
    - **C**
    - D

- **Question [1 Mark]**

  If G be a group of order pqr, $p < q < r$ being prime, then
  a) G is simple group
  b) Sylow r −subgroup is normal in G
  c) G does not have a normal subgroup of order pr
  d) If $q \nmid r - 1$, then Sylow q − subgroup is not normal in G

    - A
    - **B**
    - C
    - D

- **Question [1 Mark]**

  Which of the following is field?
  a) $\dfrac{\mathbb{C}[x]}{<x^2+2>}$
  b) $\dfrac{\mathbb{Z}[x]}{<x^2+2>}$
  c) $\dfrac{\mathbb{Q}[x]}{<x^2-2>}$
  d) $\dfrac{\mathbb{R}[x]}{<x^2-2>}$

    - A
    - B
    - **C**
    - D

- **Question [1 Mark]**

  Let $R = \mathbb{Z} \times \mathbb{Z} \times \mathbb{Z}$ and $I = \mathbb{Z} \times \mathbb{Z} \times \{0\}$. Then which one of the following is correct?
  a) I is maximal ideal but not a prime ideal of R
  b) I is prime ideal but not a maximal ideal of R
  c) I is both prime ideal and maximal ideal of R
  d) I is neither a prime ideal nor a maximal ideal of R

    - A
    - **B**

- C
- D

- **Question [1 Mark]**

Which of the following is correct?
a) A subset S of R is connected iff it is an interval
b) Subsets of compact sets are compact
c) Image of a connected space is connected
d) None of these

  - **A**
  - B
  - C
  - D

- **Question [1 Mark]**

Which of the following subsets is dense in $\mathbb{R}$ with usual topology
a) $\mathbb{Q}$
b) $\mathbb{Q}^C$
c) Neither $\mathbb{Q}$ nor $\mathbb{Q}^C$
d) Both $\mathbb{Q}$ and $\mathbb{Q}^C$

  - A
  - B
  - C
  - **D**

- **Question [1 Mark]**

Which of the following is correct?
a) Euclidean space $\mathbb{R}^k$ is not complete.
b) The space Q of rational numbers in the usual metric $d(x, y) = |x - y|$ is complete.
c) The open interval $(-1, 1)$ in $\mathbb{R}$ with metric $d(x, y) = |x - y|$ is not complete
d) None of the above

  - A
  - B
  - **C**
  - D

- **Question [1 Mark]**

The partial differential equation
$$= x^2 \frac{\partial^2 z}{\partial x^2} - (y^2 - 1)x \frac{\partial^2 z}{\partial x \partial y} + y(y - 1)^2 \frac{\partial^2 z}{\partial y^2} + x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 0$$
is hyperbolic in a region in the XY − plane if
a) $x \neq 0$ and $y = 1$
b) $x = 0$ and $y \neq 1$
c) $x = 0$ and $y = 1$
d) $x \neq 0$ and $y \neq 1$

  - A
  - B

- C
- **D**

- **Question [1 Mark]**

The initial value problem $x\frac{dy}{dx} = y + x^2, \quad x > 0, \ y(0) = 0$ has how many solutions?
a) Infinite
b) Two
c) One
d) Zero

- **A**
- B
- C
- D

- **Question [1 Mark]**

The integral surface satisfying the partial differential equation
$\frac{\partial z}{\partial x} + z^2 \frac{\partial z}{\partial y} = 0$ and passing through the straight line
$x = 1, y = z$ is
a) $(x - 1)z + z^2 = y^2$
b) $x^2 + y^2 - z^2 = 1$
c) $(y - z)x + x^2 = 1$
d) $(x - 1)z^2 + z = y$

- A
- B
- C
- **D**

- **Question [1 Mark]**

. The eigenvalues for the boundary value problem
$x'' + \lambda x = 0; \quad x(0) = 0, \ x(\pi) + x'(\pi) = 0$ satisfy
a) $\lambda + \tan(\lambda\pi) = 0$
b) $\sqrt{\lambda} - \tan(\lambda\pi) = 0$
c) $\sqrt{\lambda} + \tan(\sqrt{\lambda}\,\pi) = 0$
d) $\lambda + \tan(\sqrt{\lambda}\pi) = 0$

- A
- B
- **C**
- D

- **Question [1 Mark]**

Which of the following equation is elliptic?
a) Wave equation
b) Laplace equation
c) Heat equation
d) None of the above

- A

- B
- C
- D

- **Question [1 Mark]**

Newton-Raphson method is applicable only when
a) $f(x) \neq 0$ in the neighbourhood of actual root $x = \alpha$
b) $f'(x) = 0$ in the neighbourhood of actual root $x = \alpha$
c) $f'(x) \neq 0$ in the neighbourhood of actual root $x = \alpha$
d) None of the above

- A
- B
- **C**
- D

- **Question [1 Mark]**

The value of constant α in the third order Runga Kutta method
$u_{j+1} = u_j + \frac{1}{8}(2k_1 + \alpha k_2 + 3k_3)$ is
a) 4
b) 2
c) 1
d) 3

- A
- B
- C
- **D**

- **Question [1 Mark]**

In solving the ordinary differential equation $y' = 2x$,
$y(0) = 0$ using Euler's method, the nth iterates y_n $n \in \mathbb{N}$ satisfy
a) $y_n = x_n^2$
b) $y_n = 2x_n$
c) $y_n = x_n x_{n-1}$
d) $y_n = x_n + x_{n-1}$

- A
- B
- **C**
- D

- **Question [1 Mark]**

. The number of roots of the equation
$f(x) = x^2 - \cos x = 0$ in the interval $[\frac{-\pi}{2}, \frac{\pi}{2}]$ is equal to
a) 1
b) 3
c) 4
d) 2

- A
- B

- C
- **D**

- **Question [1 Mark]**

The necessary condition for the functional

$I[y(x)] = \int_a^b f(x, y, y')dx$ to be an extremum is

a) $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$

b) $\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$

c) $\frac{\partial f}{\partial y'} - \frac{d}{dx}\left(\frac{\partial f}{\partial y}\right) = 0$

d) $\frac{\partial f}{\partial y'} + \frac{d}{dx}\left(\frac{\partial f}{\partial y}\right) = 0$

- **A**
- B
- C
- D

- **Question [1 Mark]**

Euler's equation for the functional

$\int_{x_1}^{x_2} [a(x)y'^2 + 2b(x)yy' + c(x)y^2]dx$ is

a) First order linear differential equation
b) Second order linear differential equation
c) Second order non-linear differential equation
d) A linear differential equation of order more than second order

- A
- **B**
- C
- D

- **Question [1 Mark]**

The extremal of the function

$J = \int_a^b \frac{\sqrt{1+y'^2}}{x} dx$ is

a) Family of catenary
b) Family of parabolas
c) A family of circles
d) None of these

- A
- B
- **C**
- D

- **Question [1 Mark]**

  The approximate and exact solution of boundary value problem

  $y''(x) = 1, \quad y(0) = 0 = y(1) = 0$ are

  a) $y(x) = \frac{1}{2}(x^2 - x); y(x) = \frac{1}{2}(x^2 - x)$

  b) $y(x) = (x^2 + x); y(x) = \frac{1}{2}(x^2 - x)$

  c) $y(x) = \frac{1}{2}(x^2 + x); y(x) = \frac{1}{2}(x^2 + x)$

  d) None of these

    - **A**
    - B
    - C
    - D

- **Question [1 Mark]**

  Which of the following is not a linear integral equation:

  a) $\emptyset(x) = x - \int_0^x Sinh(x - t)\emptyset(t)dt$

  b) $\emptyset(x) = x + \int_0^x (x - t)^2 \emptyset(t)dt$

  c) $\emptyset(x) = 1 + \int_0^x e^{(x-t)}\emptyset(t)dt$

  d) $\emptyset(x) = 1 + \int_0^x Sinh(x + t)\emptyset^2(t)dt$

    - A
    - B
    - C
    - **D**

- **Question [1 Mark]**

  Which of the following is not a symmetric Kernel

  a) $K(x, t) = Sin(x + t)$

  b) $K(x, t) = xt + x^2 t^2$

  c) $K(x, t) = xt^2 + x^3 t$

  d) $K(x, t) = \begin{cases} x(1 - t), & x < t \\ (1 - x)t, & x > t \end{cases}$

    - A
    - B
    - **C**
    - D

- **Question [1 Mark]**

  The solution of integral equation

  $\int_0^x e^{x-t}\emptyset(t)dt = Sinhx$ is

  a) $\emptyset(x) = e^{-x}$

  b) $\emptyset(x) = e^x$

  c) $\emptyset(x) = Sinhx$

  d) $\emptyset(x) = Coshx$

    - **A**
    - B
    - C
    - D

- **Question [1 Mark]**

The resolvent kernel of the integral equation
$\emptyset(x) = x + \int_0^x (t - x)\emptyset(t)dt$ is
a) $Sin\ (t + x)$
b) $Cos\ (t + x)$
c) $Cos\ (t - x)$
d) $Sin\ (t - x)$

- A
- B
- C
- **D**

- **Question [1 Mark]**

If the Hamiltonian of a dynamical system is given
by $H = pq - q^2$, then as $t \to \infty$
a) $q \to \infty, \ p \to \infty$
b) $q \to 0, \ p \to 0$
c) $q \to \infty, \ p \to 0$
d) $q \to 0, \ p \to \infty$

- A
- **B**
- C
- D

- **Question [1 Mark]**

The amount of work done against friction to slide a box
in a straight line across a uniform, horizontal floor
depends most on the
a) Time taken to move the box
b) Speed of the box
c) Distance at which the box is moved
d) Direction of the box's motion

- A
- B
- **C**
- D

- **Question [1 Mark]**

  A bead slides without friction on a frictionless wire in the shape of cycloid with equation
  $x = a(\theta - \sin\theta), \quad y = a(1 + \cos\theta), 0 \le \theta \le 2\pi$
  Then the Lagrangian function is
  a) $ma^2(1 + \cos\theta)\dot{\theta}^2 - mga(1 + \cos\theta)$
  b) $ma^2(1 - \cos\theta)\dot{\theta}^2 - mga(1 + \cos\theta)$
  c) $ma^2(1 - \cos\theta)\dot{\theta}^2 + mga(1 + \cos\theta)$
  d) $ma^2(1 + \cos\theta)\dot{\theta}^2 - mga(1 - \cos\theta)$

  - A
  - **B**
  - C
  - D

- **Question [1 Mark]**

  Which of the following statement is true
  a) For every instance of an LPP the set of optimal solution is finite
  b) For every instance of an LPP the set of feasible points is unbounded
  c) For every instance of an LPP the set of basic feasible solution is finite
  d) None of these

  - A
  - B
  - **C**
  - D

- **Question [1 Mark]**

  Which of the following statement is true
  a) In simplex method, we seek to eliminate primal infeasibility and seek to maintain dual feasibility
  b) In simplex method, we seek to eliminate dual infeasibility and seek to maintain primal feasibility
  c) In dual simplex method we seek to eliminate dual infeasibility and seek to maintain primal feasibility
  d) None of these

  - A
  - **B**
  - C
  - D

- **Question [1 Mark]**

  The coefficient of correlation is unaffected by change of
  a) Origin but not scale
  b) Scale but not origin
  c) Origin as well as scale in only one of the variables
  d) Origin as well as scale in either or both the variables

- **Question [1 Mark]**

If A and B are independent events, $P(A) = 0.5$ and $P(A \cup B) = 0.6$, then $P(B)$ is

a) 0.1
b) 0.2
c) 0.3
d) 0.5

- **Question [1 Mark]**

Let y_1, y_2, y_3 be independent and identically distributed normal variable with mean 3 and variance 1. Let $\bar{y} = \frac{y_1 + y_2 + y_3}{3}$. Then $\sum_{i=1}^{3} (y_i - \bar{y})$ has a

a) Chi-square distribution with 3 degrees of freedom
b) Chi-square distribution with 2 degree of freedom
c) Chi-square distribution with 1 degree of freedom
d) Non-central chi-square distribution

- **Question [1 Mark]**

The smallest odd order of a non-abelian group is

a) 21
b) 9
c) 15
d) 7