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B.Sc. (Part - III) (Semester - V) (CBCS) Examination, January - 2023**ENGLISH (Compulsory) (Paper - III)****English for Communication****Sub. Code : 79671****Day and Date : Saturday, 07 - 01 - 2023****Total Marks : 40****Time : 2.30 p.m. to 4.30 p.m.**

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.

Q1) A) Choose the appropriate answer and complete the following sentences.

[3]

- a) The devotees, in our country, should go to the pilgrims with their eyes lowered and body couched in _____.
 - i) happiness
 - ii) fear
 - iii) anxiety
 - iv) terror
- b) For more than thirty years Morris has made a study of _____.
 - i) detective fiction
 - ii) his shortcomings
 - iii) safety measures
 - iv) jewellery shops
- c) According to Sudha Murty, _____ is inversely proportional to economic standing.
 - i) writing
 - ii) travelling
 - iii) conversation
 - iv) reading

B) Answer the following questions in one word/phrase/sentence each. [3]

- a) Who are William Morris's favorite writers?
- b) Whom did the pilgrims or travellers lose?
- c) Which award did Sudha Murty receive from Bhopal?

P.T.O.

- Q2) A)** Answer the following questions in three to four lines each. (2 out of 3) [4]
- a) What was the cause of George’s worry in the story?
 - b) Who were the incredible women in Indian history referred by Sudha Murty?
 - c) How was the first stage of pilgrimage?
- B)** Write a short note on the following in about 7-8 sentences. (any one)[4]
- a) The American
 - b) “Enterprise” as a social satire
- C)** Do as directed. [2]
- a) Write the noun form of the word “beautiful”
 - b) Give antonyms of “honest”
- Q3) A)** a) Suppose you have been called for an interview for the post of Chemist. Write a piece of conversation between you and the interviewer. [8]

OR

- b) Read the following advertisement carefully and answer the questions given below the advertisement. [8]

A Fast Growing Pharma Allopathic Company
AREA SALES MANAGER - 02 Posts
HQ - Pune (Independent working)
Candidates must have 3-5 years’ experience in
Pharmaceutical industry as an M.R. or Area Manager.
Walk in for interview on SUNDAY
Date 22nd Sept., 2019 between 09.00 to 02.00 p.m. at
Hotel Natraj, Pune-Bangalore Road, Pune.
Director, Lifeline Health Care Pvt. Ltd.,
Pune, Cell No. 8050399456

- i) What certificates will you take with if you are called for an interview for the post of area sales manager?
 - ii) Suppose you do not have any working experience, how will you answer the question about it?
 - iii) How will you explain your strong points to the interviewers?
 - iv) How will you introduce yourself?
- B) a) Suppose you participated in a N.S.S. residential camp for seven days. Write a Personal Blog describing your experiences there. [8]

OR

- b) Write an email to Municipal Corporation complaining about the bad condition of the roads in your area.

Q4) A) Write a report about your participation in a Cultural Event. [8]

OR

- B) Write a well-organized paragraph on 'My First Experience of Travelling by Train'.



Seat No.	
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B.Sc. (Part-III) (Semester - V) (CBCS) Examination, January - 2023

PHYSICS

DSE - E1 : Mathematical Physics (Paper - IX)

Sub. Code: 79677

Day and Date : Tuesday, 03 - 01 - 2023

Total Marks : 40

Time : 2.30 p.m. to 4.30 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Use of scientific calculator is allowed.

Q1) Choose the correct alternatives. [8]

a) Every partial differential equation involves at least _____ independent variables.

- | | |
|-------|-------|
| i) 1 | ii) 2 |
| ii) 3 | iv) 4 |

b) The three-dimensional Laplace equation is given by _____.

i) $\frac{\partial^3 u}{\partial x^3} + \frac{\partial^3 u}{\partial y^3} + \frac{\partial^3 u}{\partial z^3} = 0$	ii) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$
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iii) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$	iv) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{\partial^2 u}{\partial t^2}$
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c) The method of separation of variables converts the given partial differential equation into _____ Differential equation.

- | | |
|---------------|----------------------|
| i) partial | ii) partial ordinary |
| iii) ordinary | iv) none of these |

d) Legendre's differential equation has general solution in the form _____.

- | | |
|--------------------------------|-------------------------------|
| i) $y = A P_n(x)$ | ii) $y = B Q_n(x)$ |
| iii) $y = A P_n(x) + B Q_n(x)$ | iv) $y = A P_n(x) - B Q_n(x)$ |

P.T.O.

Q3) Attempt any four of the following.

[16]

- a) Define Order and Degree of partial differential equation. State two examples.
- b) Explain in brief the method of solving following second order partial

differential equation, $\frac{\partial^2 u}{dx^2} = \frac{1}{k} \frac{\partial x}{dt}$

- c) Define:
- Ordinary point.
 - regular singularities and
 - irregular singularities of the second order differential equation.
 - Find the singularities of the following differential equation.

1) $2x^2 \frac{d^2 y}{dx^2} + 7x(x+1) \frac{dy}{dx} + 3y = 0.$

2) $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + x^2 - 4 = 0.$

- v) Define Gamma Function. Prove any two properties of it.
- vi) Represent the complex number $Z_1 \times Z_2$ geometrically for two complex number Z_1 and Z_2 .



Seat No.	
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B.Sc. (Part - III) (Semester - V) (CBSC)
Examination, January - 2023
PHYSICS
DSC - E2 : Quantum Mechanics (Paper - X)
Sub. Code: 79678

Day and Date : Wednesday, 04 - 01 - 2023

Total Marks : 40

Time : 2.30 p.m. to 4.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Use of scientific calculator is allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Draw neat and labelled diagrams wherever necessary.

Q1) Select the correct alternative:

[8]

- i) The de-Broglie hypothesis was experimentally proved by__.
 - a) Einstein's theory of relativity
 - b) Planck's constant
 - c) quantum mechanics
 - d) Davisson-Germer experiment
- ii) As per de Broglie hypothesis, linear momentum (P) is ____.
 - a) \hbar/k
 - b) $\hbar w$
 - c) hk
 - d) $\hbar k$
- iii) The Eigen values of parity operator are _____.
 - a) 0,+1
 - b) 0,-1
 - c) +1,-1
 - d) +1,+2
- iv) The wavelength of matter wave is independent of _____.
 - a) momentum
 - b) mass
 - c) velocity
 - d) charge

P.T.O.

- v) The expectation value $\langle x \rangle$ of the position operator for a wave function $\psi(x)$ tells you what?
- The most likely place to find the particle
 - The least likely place to find the particle
 - The position of the particle actually is
 - The average value of the position you would get if you measured in multiple times
- vi) $[z, p_z] = \underline{\hspace{2cm}}$.
- 0
 - 1
 - $i\hbar$
 - $-i\hbar$
- vii) Coefficient of transmission is defined as ratio of ___ to ___ current densities.
- incident, transmitted
 - reflected, transmitted
 - transmitted, incident
 - incident, reflected
- viii) The energy spectrum of a particle in one dimensional rigid box has the nature of .
- infinite sequence of discrete energy levels
 - infinite sequence of equidistance energy levels
 - exponentially increasing
 - exponentially decreasing

Q2) Attempt any Two of the following

[16]

- Derive Schrodinger's time dependent wave equation for one dimensional motion.
- State and explain uncertainty relation and show that electrons do not exist in the nucleus.
- Obtain the energy eigen values and normalized wave functions for motion

of a particle along x-axis in infinite potential well'

Q3) Attempt any Four of the following

[16]

- a) Show that, $[\hat{A}, [\hat{B}, \hat{C}]] + [\hat{B}, [\hat{C}, \hat{A}]] + [\hat{C}, [\hat{A}, \hat{B}]] = 0$
- b) Prove the relation, $[L_z, L_+] = \hbar L_+$
- c) Write note on Hamiltonian operator.
- d) Write note on Degenerate states of the energy levels of the particle in three-dimensional rigid box.
- e) Write note on orthogonal and normalization conditions of the wave functions.
- f) State the conditions that the wave function should satisfy.



Seat No.	
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B.Sc. (Part - III) (Semester - V) (CBCS) Examination, January - 2023

PHYSICS

Classical Mechanics and Classical Electrodynamics (Paper-XI)

Sub. Code: 79679

Day and Date : Thursday, 5 - 01 - 2023

Total Marks : 40

Time : 2.30 p.m. to 4.30 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Draw neat labeled diagrams wherever necessary.
 - 4) Use of scientific calculator is allowed.

Q1) Select the correct alternative. [8]

- a) If constraints are introduced into the system, number of degrees of freedom _____.
 - i) increases
 - ii) decreases
 - iii) remains same
 - iv) become infinite
- b) The Principle of virtual work deals with _____ of the system.
 - i) statics
 - ii) dynamics
 - iii) kinematics
 - iv) mechanics
- c) _____ principle is an integral principle.
 - i) D'Alembert
 - ii) Euler's
 - iii) Hamilton's
 - iv) Heisenberg's
- d) Brachistochrone problem is a shortest _____ problem.
 - i) distance
 - ii) time
 - iii) velocity
 - iv) path
- e) All accelerated frames are _____ frames.
 - i) inertial
 - ii) non-inertial
 - iii) rest
 - iv) absolute

P.T.O.

- f) The negative result of Michelson-Morley experiment was satisfactorily explained by _____ hypothesis.
- i) emission
 - ii) ether drag
 - iii) partial ether drag
 - iv) length contraction
- g) Force experienced by charge in electric and magnetic fields is essentially _____.
- i) Coulomb's force
 - ii) Yukawa force
 - iii) Newton's force
 - iv) Lorentz's force
- h) If a charged particle's velocity is parallel to the magnetic field then particle moves in a _____.
- i) straight line
 - ii) circular path
 - iii) cycloid path
 - iv) spiral path

Q2) Attempt any TWO. [16]

- a) Derive Lagrange's equations of motion from Hamilton's principle.
- b) Describe Michelson-Morley experiment. Obtain an expression for the fringe shift.
- c) Show that path followed by charged particle moving in uniform magnetic field is circle.

Q3) Attempt any FOUR. [16]

- a) Explain the term 'Degrees of freedom'.
- b) Obtain Newton's equation of motion from Lagrange's equations.
- c) Write a note on 'Atwoods machine'.
- d) State and explain Hamilton's principle.
- e) Show that shortest distance between any two points in a plane is a straight line.
- f) Derive integral form of Gauss law in electrostatics.



Seat No.	
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B.Sc. (Part - III) (Semester - V) (CBCS)**Examination, January-2023****PHYSICS (Paper-XII)****DSE-E4 : Digital and Analog Circuits and Instrumentation****Subject Code: 79680****Day and Date : Friday, 06 - 01 - 2023****Total Marks : 40****Time : 2.30 p.m. to 4.30 p.m.**

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Neat diagrams must be drawn whenever necessary.
 - 4) Use of calculators/logarithmic tables are allowed.

Q1) Select correct alternative.**[8]**

- a) _____ is a logic circuit that adds two binary digit at a time.
- i) full addder
 - ii) half addder
 - iii) flip flop
 - iv) gates
- b) For_____gate output is high when all its inputs are low.
- i) NOR
 - ii) NAND
 - iii) XOR
 - iv) AND
- c) In digital circuit_____represents a binary low level.
- i) binary one
 - ii) binary zero
 - iii) binary two
 - iv) binary infinite
- d) The current amplification factor in a common emitter configuration is the ratio of_____
- i) $\Delta I_E / \Delta I_B$
 - ii) $\Delta I_B / \Delta I_E$
 - iii) $\Delta I_C / \Delta I_B$
 - iv) $\Delta I_C / \Delta I_E$
- e) Astable multivibrator has_____stable states.
- i) two
 - ii) three
 - iii) one
 - iv) zero

P.T.O.

- f) In CE transistor amplifier circuit input is applied to _____ terminal of the transistor.
- | | |
|----------------|-------------------|
| i) base | ii) emitter |
| iii) collector | iv) none of these |
- g) The arrangement of electrodes which produce a focused beam of electrons is called _____.
- | | |
|--------------------|-------------------|
| i) electron tube | ii) electron gun |
| iii) electric tube | iv) soldering gun |
- h) The CRO is used to measure _____
- | | |
|------------|------------------|
| i) voltage | ii) frequency |
| iii) phase | iv) all of above |

Q2) Attempt any Two of the following. [16]

- Explain NAND, NOR, Ex-OR and EX-NOR gate with its logic diagram.
- Draw the neat block diagram of CRO and explain the function of each block.
- Draw circuit diagram of astable multivibrator and explain its working. Find the frequency and duty cycle of this multivibrator.

Q3) Write short notes on any four of the following. [16]

- Explain NAND as a universal gate.
- Write a note on half adder.
- Write a note on crystal oscillator.
- Write a note on Lissajous figures with examples.
- State Characteristics of an ideal op-amp.
- Gives advantages and disadvantages of CE amplifier.

