2020

PHYSICS (Honours)

Paper Code : VII - A & B

[New Syllabus]

Full Marks : 90 Time : Four Hours

Important Instructions for Multiple Choice Question (MCQ)

- Write Subject Name and Code, Registration number, Session and Roll number in the space provided on the Answer Script.

  Example : Such as for Paper III-A (MCQ) and III-B (Descriptive).

  Subject Code : | III | A | & | B |

  Subject Name : | |

- Candidates are required to attempt all questions (MCQ). Below each question, four alternatives are given [i.e. (A), (B), (C), (D)]. Only one of these alternatives is 'CORRECT' answer. The candidate has to write the Correct Alternative [i.e. (A)/(B)/(C)/(D)] against each Question No. in the Answer Script.

  Example — If alternative A of 1 is correct, then write :
  1. — A

- There is no negative marking for wrong answer.

মাল্টিপল চয়েস প্রশ্নের (MCQ) জন্য জরুরী নির্দেশাবলী

- উত্তরপত্রে নির্দেশিত স্থানে বিষয়ের (Subject) নাম এবং কোড, রেজিস্ট্রেশন নম্বর, সেশন এবং রোল নম্বর লিখতে হবে।

  উদাহরণ — যেমন Paper III-A (MCQ) এবং III-B (Descriptive)।

  Subject Code : | III | A | & | B |

  Subject Name : | |

- পরীক্ষার্থীদের সবগুলি প্রশ্নের (MCQ) উত্তর দিতে হবে। প্রতিটি প্রশ্নে চারটি করে সম্ভাব্য উত্তর, যথাক্রমে (A), (B), (C) এবং (D) করে দেওয়া আছে। পরীক্ষার্থীকে তার উত্তরের স্বপক্ষে (A) / (B) / (C) / (D) সঠিক বিকল্পটিকে প্রশ্ন নম্বর উল্লেখসহ উত্তরপত্রে লিখতে হবে।

  উদাহরণ — যদি **1** নম্বর প্রশ্নের সঠিক উত্তর **A** হয় তবে লিখতে হবে :

  1. — A

- ভুল উত্তরের জন্য কোন নেগেটিভ মার্কিং নেই।

Turn Over

Paper Code : VII - A

Full Marks : 20 Time : Thirty Minutes

Choose the correct answer.

Each question carries 4 marks.

1.For one dimensional free-particle, the degrees of freedom is..

A. 0
B. 1
C. 3
D. None of these

2. The Bandwidth of an a.c. amplifier having a lower critical frequency of 1 kHz and an upper critical frequency of 10 kHz is---

A. 1 kHz
B. 10 kHz
C. 9 kHz
D. 11kHz

3. In a transistor connected in CE mode if the base current is changed from 20μA to 40μA at a fixed V_{CE} =8V, the collector current changes from 2.5mA to 4.5 mA. Then the value of β_{ac} is

A. 100
B. 200
C. 0.02
D. 0.01

4. Consider an ideal gas system in which particles can exist in any one of the three states with energy equal to 0, 1, 2, 3 energy units and no other. Suppose the system consists of 3 distinguishable particles a, b and c and the total energy of the system is 3 energy units. How many ways can the 3 particles be distributed among the energy levels consistent with the condition that the total energy of the system is 3 unit. THE PARTICLES ARE DISTINGUISHABLE.

A. 6
B. 9
C. 10
D. 3

Turn Over

5.In an experiment of FET following readings were obtained

$V_{GS}(V)$	$V_{DS}(V)$	$I_D(mA)$
0	7.0	10.0
0	15.0	10.25
-0.2	15.0	9.65

The amplification factor of the FET is-

A. $\mu = 9.6$
B. $\mu = 3.2$
C. $\mu = 32$
D. $\mu = 96$

Turn Over

2020

PHYSICS (Honours)

Paper Code : VII - B

[New Syllabus]

Full Marks : 70 Time : Three Hours Thirty Minutes

The figures in the margin indicate full marks.

Answer any *five* questions.

1. (a) Derive Lagrange's equations for conservative system from D' Alembert's Principle.

   (b) Find the equation of motion of a simple pendulum using Lagrangian formulation.

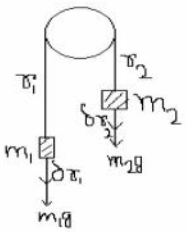
   9+5

2. (a) Derive Hamilton's canonical equations of motion in generalised co-ordinates.

   (b) Prove that if a given co-ordinate is cyclic in Lagrangian, it will also be cyclic in Hamiltonian. 9+5

3. a) What is the basic difference between rheonomic and scleronomic constraints.

   b) Using D'Alembert's principle obtain the relation $\ddot{\vec{r}}_1=\{(m_1-m_2)/(m_1+m_2)\}\vec{g}$



   c) Prove that the conjugate momentum of a cyclic co-ordinate is conserved.

   d) Prove that the Hamiltonian is the total energy of a conservative system.

   2+5+3+4

Turn Over

4. a) State and prove Bernoulli's theorem for the steady streamline flow of a liquid.

b) Using Hamiltonian formulation prove that the areal velocity of a particle moving under central force field is constant of motion. 9+5

5. a) Describe the construction of an enhancement- type MOSFET and explain its operation.

b) Describe the advantages of negative feedback in transistor amplifier. 10+4

6. a) Draw the circuit diagram of a Hartley oscillator and explain its working.

b) Write a short note on A/D converter. 10+4

7. a) How is an RS flip-flop converted into a JK flip-flop? Give its truth table and explain how it is obtained.

b)Draw the block diagram of a general purpose CRO and indicate its basic components. 10+4

8. a)Mentioning the necessary conditions, obtain the Boltzmann distribution function for an ensemble of fermions.

b)State and deduce Stirling's approximation formula. 9+5

9. a) Using F-D distribution function for an electron gas, obtain Richardson – Dushman Equation for thermionic emission.

b) Obtain the phase space diagram of one dimensional harmonic oscillator. 9+5

10. a)Applying B.E. distribution function deduce Planck's law of radiation.

b) Write a short note on 'Bose-Einstein condensation'. 7+7
