

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL – 2024**

ENGINEERING PHYSICS-II

[Maximum Marks : 100]

[Time : 3 hours]

PART – A
(Maximum Marks : 10)

Marks

I. Answer **all** questions in one or two sentences. Each question carries 2 marks.

1. Write down the SI units of moment of inertia and torque.
2. What is meant by gravitational potential energy?
3. Distinguish between resistance and resistivity.
4. What is meant by population inversion in laser?
5. What is a chain reaction in nuclear fission? (5x2=10)

PART – B
(Maximum Marks : 30)

II. Answer any **five** of the following questions. Each question carries 6 marks.

1. Derive the expression for moment of inertia of a circular disk about its own axis.
2. Derive the expression for centripetal acceleration of a body in a uniform circular motion.
3. Discuss the variation of acceleration due to gravity with altitude and depth.
4. Describe the theory and working of moving coil galvanometer.
5. What is a shunt resistance and explain it with relevant equations?
6. Explain the working principle of Helium-Neon laser with a neat diagram.
7. Explain the components of nuclear reactor. (5x6=30)

PART – C
(Maximum Marks : 60)

(Answer **one full** question from each unit. Each full question carries 15 marks)

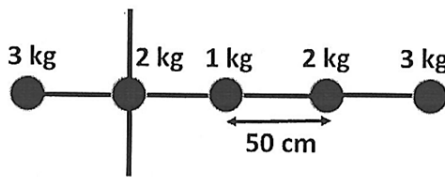
UNIT – I

- III.** (a) What is meant by banking of roads? (3)
- (b) A broad gauge railway track is constructed around a curve of radius 600m. If the track is designed for a speed of 1 km/hr, calculate the height difference between outer and inner rails. (Width of broad gauge is 1.4m and $g=9.8 \text{ m/s}^2$. (6)

- (c) A string can sustain a maximum tension of 100 N without breaking. A mass of 1 kg is attached to the end of a string 1.0 m long. Find out the angular velocity and angular acceleration. (6)

OR

- IV.** (a) What is meant by radius of gyration? (3)
- (b) State theorems on moment of inertia. Explain it with figure and equations. (6)
- (c) Five masses 3 kg, 2 kg, 1 kg, 2 kg and 3 kg are placed on a massless rod as shown in figure. The distances between any two consecutive masses is 50 cm. Find the moment of inertia and radius of gyration about an axis passing through second mass and perpendicular to the rod. (6)



UNIT – II

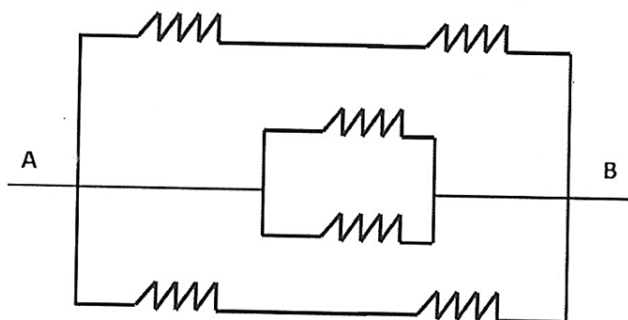
- V.** (a) What is escape velocity? (3)
- (b) Derive the expression for escape velocity. (6)
- (c) Find the escape velocity of moon from the following data. Mass of moon is 7.4×10^{22} kg, its radius is 1740 km and $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$. (6)

OR

- VI.** (a) What is Newton's law of gravitation? (3)
- (b) Derive the expression for orbital velocity of an artificial satellite. (6)
- (c) An artificial satellite revolves around earth at a height of 1200 km above the surface of earth. Find orbital velocity [radius of earth is 6400 km and $g = 9.8 \text{ m/s}^2$]. (6)

UNIT – III

- VII.** (a) State Ohm's law. (3)
- (b) With the help of neat diagram, derive balancing condition of Wheatstone's bridge. (6)
- (c) Find the equivalent resistance between points A and B for the resistance combination shown in the below figure if each resistance has a value of 10Ω . (6)



OR

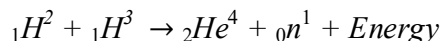
- VIII. (a) State and explain Biot-Savart law. (3)
- (b) How we can convert a galvanometer into an ammeter? (6)
- (c) A conductor of 15 cm long carrying a current 4.0 A lies at 60° to a magnetic field of intensity 3 tesla. Calculate the force on the conductor. (6)

UNIT – IV

- IX. (a) What is photoelectric work function? (3)
- (b) Explain Einstein's photoelectric equation and calculate maximum velocity of the photoelectron. (6)
- (c) When a metal is irradiated with a light of wavelength 400nm whose workfunction is 1.1 eV? What is the maximum velocity of the ejected electrons? (6)
- [$h=6.63 \times 10^{-34}$ Js; $c=3 \times 10^8$ m/s; mass of electron = 9.1×10^{-31} kg].

OR

- X. (a) Give three applications of nuclear reactors. (3)
- (b) State and explain Einstein's mass energy relation. Use this relation to explain energy production in nuclear fission and fusion. (6)
- (c) Find the energy released in MeV in fusion reaction.



Give that mass of ${}_1H^2 = 2.0147$ u; mass of ${}_1H^3 = 3.0160$ u;
 mass of ${}_2He^4 = 4.0026$ u; mass of ${}_0n^1 = 1.0087$ u. (6)
