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(REVISION — 2015)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

ENGINEERING PHYSICS - II

[*Time* : 3 hours

(Maximum marks : 100)

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 for angular velocity and angular acceleration.
2. What is meant by escape velocity ?
3. State Ohm's law.
4. What is monochromatic radiation ?
5. What is nuclear fusion ?

$(5 \times 2 = 10)$

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 (a) a diameter (b) a tangent.
2. Derive the expression for the centripetal acceleration of a body in uniform circular motion.
3. Using Newton's theory of gravity, derive the expression for the period of an artificial satellite.
4. Discuss the variation of acceleration due to gravity with altitude, latitude and depth.
5. With the help of a neat diagram explain the theory and working of a moving coil galvanometer.
6. State Kirchhoff's laws and use these to derive the condition for balancing of a Wheatstone's bridge.
7. Explain the principles and working of a typical nuclear power reactor. $(5 \times 6 = 30)$

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Explain the term moment of inertia. State the theorems of moment of inertia. 3

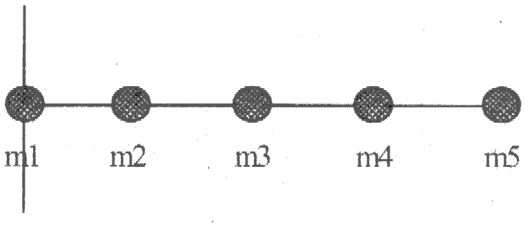
(b) A disk of moment of inertia 1.5 kgm^2 is initially at rest. It is acted upon by a constant torque of 120 Nm for 5 s. Find the final angular momentum and kinetic energy of the disk. 6

(c) A thin circular ring of mass 0.5 kg and radius 15 cm is rolling at a constant speed of 60 rpm. Calculate its moment of inertia, angular momentum and total kinetic energy. 6

OR

IV (a) Why does a cyclist lean inward while riding along a curved path ? Write down the relevant formula for the leaning angle. 3

(b) Five masses ml = 1 kg, m2 = 2 kg, m3 = 3 kg, m4 = 4 kg and m5 = 5 kg are arranged along a line as shown in figure such that the separation between adjacent masses is 0.2 m. Calculate the moment of inertia and radius of gyration of the system about an axis perpendicular to the line of masses and through the mass ml.



6

(c) A wheel starting from rest rotates with a constant angular acceleration of 5π rad/s^2 for 10 s. Calculate the final angular velocity and the total number of revolutions it makes within this duration. 6

UNIT — II

V (a) What is meant by escape velocity ? Derive an expression for it. 3

(b) Derive the expression for orbital velocity and period of an artificial satellite around the Earth. 6

(c) Given that the radius of the Earth as 6400 km and acceleration due to gravity at the surface of the Earth, g = 9.8 ms^{-2}. Calculate the value of acceleration due to gravity at an altitude, h = 10 km. Also calculate the value of g at a depth d = 10 km. 6

OR

Marks

VI (a) Discuss polar satellites and their uses. 3

(b) Find the orbital velocity of an artificial satellite moving close to the surface of the Earth (First cosmic velocity). Also calculate the period. ($R = 6400$ km and $g = 9.8$ ms^{-2}) 6

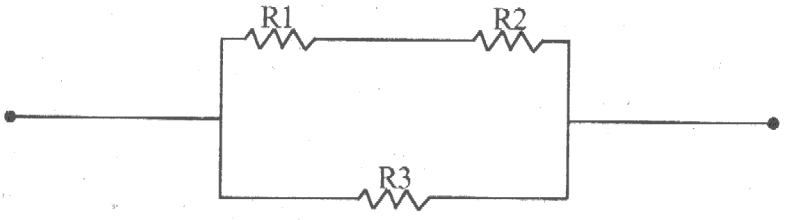
(c) Find out the height at which the acceleration due to gravity becomes half its value on the surface of the Earth. ($R = 6400$ km) 6

UNIT — III

VII (a) State Ohm's law and laws of combination of resistances. 3

(b) A long resistance wire admits a current of 5 A when a potential difference of 10 V is applied across it. If the wire is cut into two pieces of equal length and connected to the same voltage source as a parallel combination, then calculate the effective resistance. 6

(c) Three resistances R1 = 4Ω, R2 = 6Ω and R3=10Ω are connected as shown in figure. Calculate the effective resistance of the combination as measured across the open terminals.



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OR

VIII (a) With the help of a circuit diagram explain how Ohm's law can be verified ? 3

(b) State Biot-Savart's law and use it to derive the expression for the magnetic field produces at the centre of a current carrying circular coil. 6

(c) Given three resistances 6 Ω each. Draw the diagrams explaining how these resistances can be combined to give 18 Ω, 9 Ω and 2 Ω. 6

UNIT — IV

IX (a) The photo electric work function of copper is 7.2×10^{-19}. Calculate the threshold wavelength. [Speed of light (c) = 3×10^8 ms^{-1}, Planck's constant (h) = 6.63×10^{-34} Js] 3

(b) Explain clearly the concepts of photon, photoelectric work function and threshold wavelength. 6

(c) State and explain Einstein's mass — energy relation. Use it to explain energy production in the case of nuclear fission and fusion. 6

OR

X (a) Explain the advantages of solid state lasers. 3

(b) With the help of a neat figure explain the working of He-Ne laser. 6

(c) Explain the characteristic properties of laser light. 6