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SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — APRIL, 2017

ENGINEERING PHYSICS - II

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. Give two examples for centripetal force.
2. What is a polar satellite ?
3. Distinguish between resistance and resistivity.
4. State two important characteristics of laser.
5. Distinguish between fission and fusion. (5 × 2=10)

PART — B

(Maximum marks : 30)

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

1. Derive an expression for total kinetic energy of a disc rolling and use this formula to calculate the Kinetic energy of disc of mass 2kg and radius 20cm rolling with an angular velocity 10 rad/s.
2. A string can sustain a maximum tension of 100N without breaking. A mass of 200g is attached to the end of a string 50cm long. Find the maximum angular velocity at the breaking point. Also find the linear velocity with which the mass will fly off when the string breaks.
3. Calculate orbital velocity of a geostationary satellite. ($g = 9.8 m/s^2$, R = 6400 km, h =36000km)
4. How can a galvanometer be converted to an ammeter ? A galvanometer of resistance 100 Ω gives full scale deflection for 10mA. Calculate the shunt resistance needed to construct an ammeter of range 10A.
5. Two resistances 1.5Ω and 1Ω are connected in parallel. The combination is connected to the terminals of a 3 volt cell of negligible internal resistance. Find the effective resistance and the current through each resistors.

Marks

6. With the help of a neat diagram, explain the working principle of a Helium-Neon laser.

7. Radiation of wavelength 300nm falls on a material of work function 2eV. Calculate the maximum velocity of the ejected electrons. Mass of electron is 9.1×10^{-31} kg, $h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^8$m/s, 1 eV= 1.6×10^{-19}J (5 × 6 = 30)

PART — C

(Maximum marks : 60)

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

Unit— I

III (a) Explain the terms moment of inertia, angular momentum and torque. 3

(b) Derive an expression for the moment of inertia of a uniform circular disc about an axis passing through its centre and perpendicular to its plane. 6

(c) Under the action of a torque, a wheel is making revolutions about its axis with uniform angular acceleration. Starting from rest it attains an angular velocity of 200 rev/s in 5 seconds. Find the angular acceleration and the angle turned during this time. 6

Or

IV (a) Define moment of inertia and radius of gyration. Give their units. 3

(b) Explain parallel axes theorem. Calculate the moment of inertia of a uniform disc of mass 2kg and radius 0.5m about a tangent. 6

(c) A circular disc of mas 2kg rotates about its axis at an angular speed 100 rad/s. The radius of the disc is 0.2m. Calculate the moment of inertia, angular momentum and kinetic energy associated with the disc. 6

Unit — II

V (a) How can we estimate the mass of the Earth by measuring the value of Gravitational constant ? 3

(b) What is meant by geostationary satellites ? Derive an expression for the height of a geostationary satellite above the surface of the Earth. 6

(c) An artificial satellite is revolving around the Earth at height of 600km above the surface of the Earth. Find the period of revolution of the satellite. ($g = 9.8m/s^2$, R = 6400km) 6

Or

VI (a) State Newton's law of gravitation and use this to derive an expression for the acceleration due to gravity on the surface of Earth. 3

(b) Derive an expression for the escape velocity. Calculate the escape velocity from the Moon. Mass of Moon is 7.4×10^{22}kg, and radius of the Moon is 1740km, $G = 6.67 \times 10^{-11}Nm^2kg^{-2}$ 6

(c) Write an essay on artificial satellites and their applications. 6

Marks

Unit — III

VII (a) State and explain Biot-Savart law. 3

(b) With the help of a neat diagram, derive the balancing condition of a Wheatstone's bridge. 6

(c) A straight current carrying conductor of length 2m experiences a force 5N, when placed perpendicular to a uniform magnetic field of 0.5 tesla. Determine the current flowing through it. 6

Or

VIII (a) State Kirchhoff's laws. 3

(b) Describe the principle, construction and working of a moving coil galvanometer. 6

(c) Two wires have an effective resistance 10Ω when connected in series and 2.4Ω when connected in parallel. Find the individual resistances. 6

Unit — IV

IX (a) Describe the laws of photoelectric effect. 3

(b) Mention the essential components of a nuclear reactor and explain the working of a power reactor. 6

(c) What is a photon ? State plancks equation for the energy of a photon. Calculate the wavelength of a photon, if its energy is 4.48×10^{-19}J. ($h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^8$m/s) 6

Or

X (a) Explain the term chain reaction as applied to nuclear fission. 3

(b) Give Einstein's explanation of photoelectric effect. Derive expression for the maximum velocity of the photo electron. 6

(c) Find the energy released when one U235 atom undergoes fission in the reaction $_{92}U^{235} + {}_0n^1 \rightarrow {}_{56}Ba^{141} + {}_{36}Kr^{92} + 3{}_0n^1 +$ energy. Given that mass of $_{92}U^{235}$ = 235.044u, mass of neutron = 1.0087 u, mass of Barium = 140.9136u and mass of Krypton = 91.8976u.(1u = 14.94×10^{-11}J) 6