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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

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. What is meant by banking of roads ?
2. Derive the relation between angular momentum and rotational kinetic energy.
3. What is a Polar satellite ?
4. Distinguish between stimulated and spontaneous emission.
5. What is a moderator ? (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 the moment of inertia of a disc about
   (a) an axis passing through the centre and perpendicular to its plane.
   (b) about a diameter.
2. What is meant by centripetal Acceleration ? Derive its expression.
3. Discuss the variation of acceleration due to gravity 'g' with altitude.
4. State and explain Kirchhoff's Laws.
5. Derive an expression for the magnetic field at the centre of a current carrying coil.
6. Give Einstein's explanation of Photoelectric effect.
7. Discuss the various forms of energy sources. (5×6 = 30)

PART — C

(Maximum marks : 60)

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

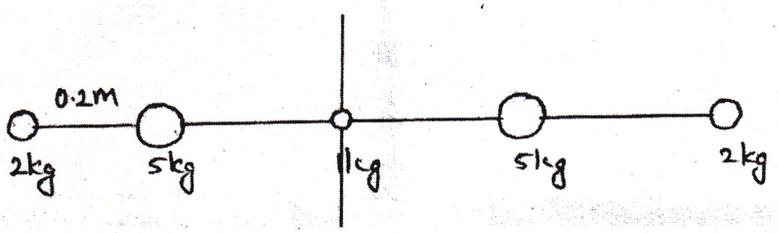
UNIT — I

III (a) The rotor of a motor has a moment of inertia 15 kgm^2. Calculate the torque required to increase its speed of rotation from 320 rpm to 600 rpm in 4 seconds. 3

(b) Define radius of gyration. What is its SI unit ? What is its value for a uniform disc of mass M and radius R, if the disc is rotating about an axis passing through the centre and perpendicular to its plane. 6

Marks

(c) Five masses 2 kg, 5 kg, 1 kg, 5 kg and 2 kg are placed on a mass less rod as shown in figure. The distance between consecutive masses is 0.2 m. Find the moment of inertia about the perpendicular axis passing through the centre of mass.



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OR

IV (a) A string can sustain a maximum tension of 100N without breaking. A mass of 1 kg is attached to the end of the string 1m long and is rotated in a horizontal plane. Find out the maximum number of revolutions possible per second. 3

(b) Show that the centripetal force for a particle of mass m moving along the circle of radius R is $m\omega^2 R$ 6

(c) A body of mass M is attached to a string of length L and is revolved in a horizontal plane. If the string can withstand a maximum tension F, show that the maximum angular velocity. With which it can be revolved is given by the equation

$\omega = \left(F/_{ML}\right)^{1/2}$ 6

UNIT — II

V (a) The acceleration due to gravity at a height h above the earth's surface is 9.1 m/s^2. Find h if the surface value of g is 9.8 m/s^2 and radius of earth is 6400 km. 3

(b) Obtain n expression for the orbital velocity and period of revolution of an artificial satellite revolving close to the surface of the earth. 6

(c) Explain the concept of geostationary satellite. Derive an expression for its height above the earth. 6

OR

VI (a) Prove that first cosmic velocity $V_0 = \sqrt{gR}$ 3

(b) State Newton's Law of Universal Gravitation. Show that the acceleration due to gravity $g = 4/3\ \pi G\rho r$ where ρ is the mean density of earth and R is the radius of earth. 6

(c) Two iron spheres each of radius 50cm are placed at a distance 2m between their centres. If the force of attraction between them is 2.923×10^{-4} N, Determine the gravitational constant G. Density of iron is 8000 kg/M^3. 6

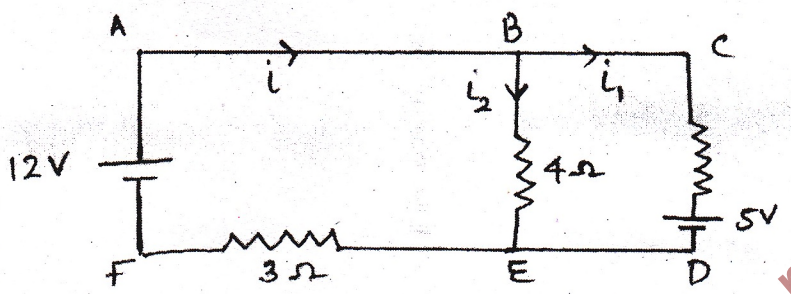
UNIT — III

Marks

VII (a) Explain the principle of Shunt resistance. 3

(b) Describe a meter bridge. How it is used for the measurement of resistivity. 6

(c) Two cells of emf 12 V and 5 V and three resistances 2Ω, 3Ω and 4Ω are connected as Shown. Find the current i_1, i_2 and I using Kirchhoff's laws.



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OR

VIII (a) Calculate the magnetic field due to a straight conductor of length 0.5m carrying a current of 3 A at a point equidistant from the ends of the conductor and 5 cm away from its centre. 3

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

(c) How can a galvanometer be converted into a voltmeter ? A galvanometer having a resistance 50Ω gives full scale deflection for 10 mA. With what resistance connected in series, the galvanometer can be converted into a voltmeter of range 5V ? 6

UNIT — IV

IX (a) Which are the main characteristics of laser radiation ? 3

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

(c) What is meant by pumping ? How this is achieved in solid and gas lasers ? Write down the main applications of lasers. 6

OR

X (a) The threshold frequency for initiating photoelectric effect in a metal is 5×10^{14} Hz. Calculate the frequency of radiation that should be incident on this metal to get electrons of kinetic energy 3.15×10^{-19} J. 3

(b) What are the essential components of a nuclear reactor ? Describe the functions of each component. 6

(c) A star derived its energy from the fusion of 4 protons to produce a helium nucleus and 2 positrons. Calculate the energy released in MeV if the masses of proton, helium and positron are respectively 1.00783u; 4.0026u and 0.00055u. Assume that 1u is equivalent to 931 MeV. 6