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(REVISION — 2015)

Reg. No. .....

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 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. Write the SI unit of angular velocity and angular acceleration.
2. Give two uses of geo-stationary satellites.
3. Ceiling fans have axes of rotation passing through its centre. Give reason.
4. Calculate the effective resistance of 2 resistors R1=2 Ω and R2=3 Ω in parallel.
5. What do you understand by the term "nuclear fusion" ? (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Define angular momentum "L" and torque "ι" of an object in rotational motion and write SI unit of each quantity. What is the relationship between L and ι ?
2. Write three equations of translatory motion and explain the terms. Write the corresponding equations for rotational motion and explain each term.
3. Derive an expression for acceleration due to gravity at Earth's surface starting from Newton's law of gravitation. Find its value, considering earth as a sphere of radius 6400 km and mass 6×10^{24} kg. Take $G = 6.7 \times 10^{-11}$ Nm^2kg^{-2}
4. Derive an expression for orbital velocity of a satellite in terms of acceleration due to gravity at earth's surface.
5. Give the diagram of a metre bridge and explain its working principle. How is it used to find an unknown resistance ?
6. State and explain Biot and Savart law. A small current element is placed in north-south direction. What will be the magnetic field at a point 20 cm away and along north-east direction. The length of current element is 1cm and carries a current of 2 amperes.
7. Explain the characteristics of light from a laser source. Give three applications of laser.

(5×6 = 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 physics behind "banking of roads and rails". 3

(b) Derive an expression for moment of inertia of a circular disc about a perpendicular axis through the centre. 6

(c) A particle is moving along the circumference of a circle of radius 3 m. If the angular velocity changes from 4 to 10 revolutions per second within 6 seconds, calculate the angular and linear acceleration. 6

OR

IV (a) Explain the idea of centripetal force with one example. 3

(b) Derive an expression for total kinetic energy of a circular disc rolling on a horizontal surface. 6

(c) A wheel of mass 10kg and radius of gyration 2m makes 30 revolutions per minute. Calculate the torque required to increase the angular velocity to 60 revolutions per minute in 50 seconds. 6

UNIT — II

V (a) What do you know about a polar-satellite ? 3

(b) Define gravitational potential energy. What do you mean by gravitational potential of a heavy mass M. Calculate the gravitational potential energy of earth-moon system if mass of earth is 6×10^{24}kg, mass of the moon is 7.3×10^{22}kg and earth-moon distance is 384400 km. 6

(c) Acceleration due to gravity at earth's surface is 9.8 m/s^2. Considering earth as a sphere of radius 6400 km, find acceleration due to gravity at an altitude 64 km. What will be the acceleration due to gravity at a depth 100 km from earth's surface ? 6

OR

VI (a) Calculate escape velocity from a star of mass 6×10^{26} kg and radius 9400 km. 3

(b) With necessary theory derive an expression for escape velocity from earth's surface. 6

(c) We have 2 stars of masses 12×10^{30} kg and 15×10^{28} kg respectively, separated by a distance of 2×10^5km. Find the gravitational force between them. What will be the potential energy ? 6

Marks

UNIT — III

VII (a) Two aluminium wires have their lengths in the ratio 1:3 and radii in the ratio 2:3. Find the ratio of their resistances. 3

(b) Draw the circuit diagram of Wheatstone's bridge circuit. Analyse the circuit using Kirchhoff's laws and obtain the balancing condition of resistances. 6

(c) Using a circuit diagram, explain how galvanometer can be converted to a voltmeter. 6

OR

VIII (a) Resistance of a wire of length 20m and radius 10 mm is 12kΩ. Find its resistivity and conductivity. 3

(b) Draw the circuit diagrams for 2 resistors in parallel, connected to a potential difference "V". With necessary arguments, arrive at an expression for effective resistance R_p. 6

(c) Give the circuit diagram and calculate the currents through the 2 resistors 2 Ω and 10 Ω, if they are in parallel and connected to a potential difference of 6 volt. 6

UNIT — IV

IX (a) Explain quantum theory of light. 3

(b) What are the laws of photoelectric effect ? Explain them using Einstein's theory. 6

(c) Light of wavelength 400 nm falls on a metal of work function 1.1 eV. Can we observe photoelectric effect ? If yes, what will be the maximum kinetic energy of the photoelectrons ? ($h = 6.626 \times 10^{-34}$ Js) 6

OR

X (a) What are the advantages of gas laser over solid state laser ? 3

(b) Explain the principle and working of Ruby laser. 6

(c) The threshold wavelength of a metal for photoelectric emission is 600 nm. Determine the kinetic energy (in joules) of the electrons emitted when light of wavelength 500 nm falls on the metal. ($h = 6.626 \times 10^{-34}$ Js) 6
