4. Calculate the surface integral of a magnetic field over a surface.

(a) Maximum
(b) Minimum
(c) Zero
(d) Equal to its magnetic flux through that surface

5. If Current and Voltage are 90 Degree Out of Phase, Then The Power (P) will be_____.

(a) Zero
(b) Maximum
(c) Minimum
(d) Infinite

6. Find the internal field when the applied field is 12 units, molecular field constant is 0.1 units and the magnetization is 74 units.

(a) 86
(b) 62
(c) 752
(d) 19.4

7. The direction of induced e.m.f. can be found by

(a) Laplace's law
(b) Lenz's law
(c) Fleming's right hand rule
(d) Kirchhoff's voltage law

8. What is a free-body diagram?

(a) It's a sketch of a moving body that shows internal forces of the body and reaction forces
(b) It's a sketch of an undisturbed body that shows external forces of the body
(c) It's a sketch of an isolated body that shows external forces of the body and reaction forces
(d) It's a sketch of a body in motion that shows bending forces of the body

9. A scooter weighs 120kg f. Brakes are applied so that wheels stop rolling and start skidding. Find the force of friction if the coefficient of friction is 0.4.

(a) 60kg f
(b) 48kg f
(c) 25kg f
(d) 32kg f

10. Couple is formed due to two _____

Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – March/April 2025

Programme Name: B Tech (ME)

Semester: I

Subject Code: UG11T4102

Subject Name: PHYSICS

Date: 04.03.2025 Max Marks: 70

Duration: 03 Hrs Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective sections.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. For any medium , electric flux density D is related to electric intensity E by the equation

(a) $D= \varepsilon_0 E$
(b) $D= \varepsilon_0 \varepsilon_r E$
(c) $D= E / \varepsilon_0 \varepsilon_r$
(d) $D= \varepsilon_0 E / \varepsilon_r$

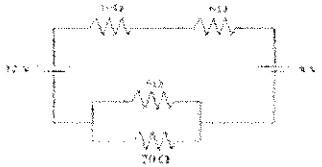
2. Give the number of electrons passing through a wire per minute. The current flowing through it is 500mA.

(a) 1.875 × 1020
(b) 6.875 × 1020
(c) 1.875 × 10-20
(d) 6.875 × 10-20

3. Which of the following statements is correct?

(a) Kirchhoff's law states that the current traveling towards a junction equals the voltage drop.
(b) The current flowing towards a junction is equal to the resistance across the junction, according to Kirchhoff's law.
(c) The current flowing into a junction is equal to the current exiting the junction, according to Kirchhoff's law.
(d) Kirchhoff's law states that the current traveling towards a junction is equal to the sum of all currents in the circuit.

(b) Determine the electric current that flows in the circuit as shown in the figure below. 4M



20. (a) state the difference between self inductance & mutual inductance. 5M
    (b) An alternating current of frequency 60 Hz has a maximum value of 12 A. 5M
        (i) Write down the equation for instantaneous values.
        (ii) Find the value of the current after 1/360 seconds.
        (iii) time taken to reach 9.6 A for the first time.

21. (a) State & prove Law of parallelogram of forces 5M
    (b) Two forces of 100 N and 150 N are acting simultaneously at a point. Find the resultant if the angle between them is 45° 5M

22. (a) Define coefficient of friction and angle of friction. Establish relation between them. also show that angle of friction and angle of repose are equal. 6M
    (b) A mass of 4 kg rests on a horizontal plane. The plane is gradually inclined until at an angle θ = 15° with the horizontal, the mass just begins to slide. What is the coefficient of static friction between the block and the surface ? 4M

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(a) like, parallel and non-collinear forces of same magnitude
(b) like, perpendicular and collinear forces of different magnitude
(c) unlike, parallel and non-collinear forces of same magnitude
(d) unlike, perpendicular and non-collinear forces of different magnitude

Section B

Five Questions of 02 Marks each

11. Draw equipotential surfaces:
    (i) Due to uniform electric field (ii) For a point charge (q < o)

12. Define skin effect. What are the factors that affect skin effect?

13. What are magnetic field lines? Justify the following statements:
    (i) Two magnetic field lines never intersect each other.
    (ii) Magnetic fields are closed curves.

14. State the Coulomb's laws of dry friction.

15 Define various types of supports with diagrams.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. (a) Explain dielectric strength and its boundary conditions. 7M
    (b) Show that the electric field is negative of potential gradient. 3M

17. (a) What do you mean by drift velocity and mobility ? Discuss current density. 5M
    (b) Write the mathematical expression for Joules law of heating. Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V. 5M

18. (a) what is the Hall effect and State Ampere's circuit law 3M
    (b) Discuss the B-H curve of a ferromagnetic material and explain the following
    (i) magnetic saturation (ii) hysteresis (iii) residual magnetism
    (iv) coercive force. 7M

19. (a) Explain current division rule and voltage division rule. 6M