

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023
Programme Name: B Tech (ME)
Semester: I
Subject Code: UG11T4102
Subject Name: Physics

Date: 14.06.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions :-

- (i) All Sections (A & B) are to be attempted.
- (ii) In section B, Attempt any five question out of seven question.
- (iii) Options, if any, are specified in respective section.

Section A

Attempt all following question [10 Question = 10 × 1 = 10 Marks]

1. Two charges of equal magnitude separated by some distance, to obtain same force if magnitude of charges increased by 50% then distance of separation must be increased by _____

- a) 25 %
- b) 75 %
- c) 50 %
- d) 40 %

2. The property in which an increase in voltage drop across terminal causing drop in electric current

- a) Negative Resistance
- b) Resistance
- c) Positive Capacitance
- d) Positive Resistance

3. By which law, the direction of induced EMF will be identified

- a) Faraday's first law
- b) Faraday's second law
- c) Lenz's law
- d) Fleming's left hand rule

4. Which among the following is not passive component?

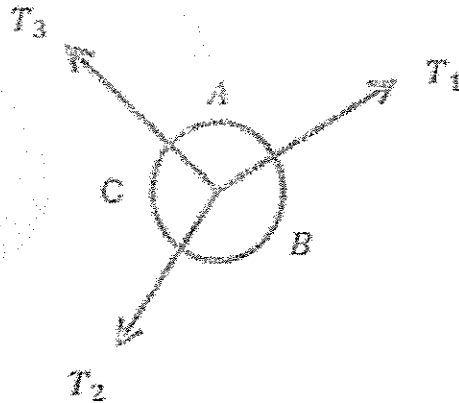
- a) Resistor
- b) Capacitor
- c) Inductor
- d) Diode

5. A student inserts a bar magnet in the coil. The student observes deflection in the galvanometer connected to the coil. What will happen if the magnet is continuously getting in and out of the coil?

- (a) The current induced in the coil will increase
- (b) The current will change its direction continuously
- (c) The magnetic field will create a motion in the coil
- (d) The magnetic field of the bar magnet would keep decreasing

6. The force system is said to be in equilibrium when
- $\sum f_x = 0$ and $\sum f_y = 0$
 - $f_x = 0$ and $f_y = 0$
 - $\sum f_x \neq 0$ and $\sum f_y = 0$
 - $\sum f_x = \delta_x$ and $\sum f_y = \delta_y$
7. The physical quantity which has magnitude, as well as direction, is called _____ quantity.
- Vector
 - Scalar
 - Null
 - Conservative
8. What are the types of kinetic friction?
- Sliding friction, rolling friction, and adhesive friction
 - Sliding friction and rolling friction
 - Rolling friction and adhesive friction
 - Sliding friction and adhesive friction
9. Consider the following figure, identify the correct option

- $\frac{T_1}{\sin A} = \frac{T_2}{\sin B} = \frac{T_3}{\sin C}$
- $\frac{T_3}{\cos B} = \frac{T_1}{\cos C} = \frac{T_2}{\cos A}$
- $\frac{\sin C}{T_2} = \frac{\sin B}{T_1} = \frac{\sin A}{T_3}$
- $\frac{T_2}{\sin A} = \frac{T_1}{\sin C} = \frac{T_3}{\sin B}$



10. What does the moment of the force measure?
- The tendency of rotation of the body along any axis
 - The moment of inertia of the body about any axis
 - The couple moment produced by the single force acting on the body
 - The total work is done on the body by the force

Section B

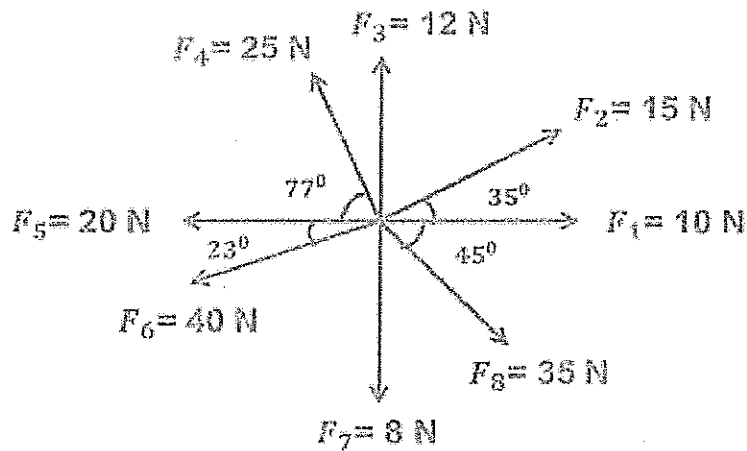
Answer the following question [5 × 2 = 10 Marks]

11. An electric field in a medium with relative permittivity 7 passes into a medium of relative permittivity 2. If E makes an angle of 60° with the normal to the boundary in the first dielectric, what angle does the field make with the normal in the second dielectric ?
12. Explain Biot Savarts Law
13. Define the Couple and Moment of a couple?
14. State characteristics of force
15. Draw a classification flow chart for the system of force

Section C

[Total seven long answer question , Any five = 5 × 10 = 50 Marks]

- 16 a) State & explain working principle of electric kettle. State Joule's law of heating. [5 Mark]
- b) State and explain law of parallelogram of force, and derive expression for resultant and direction of resultant [5 Mark]
17. a) A conductor material has free-electron density of 10^{24} electrons/ m^3 . When a voltage is applied, a constant drift velocity of 1.5×10^{-2} m/s is attained by electrons. If the cross sectional area of material is 1 cm^2 , Calculate the magnitude of the current. Electronic charge is 1.6×10^{-19} Coulomb [5 Mark]
- b) Explain types of supports and support reactions with neat diagrams . [5 Mark]
- 18 a) A long solenoid has 200 turns per cm and carries a current of 2.5A. What is the magnetic field at its centre? [3 Mark]
- b) Define Diamagnetic, paramagnetic and ferromagnetic material [3 Mark]
- c) Explain types of supports and support reactions with neat diagrams . [4 M]
- 19 a) A series magnetic circuit that has 3 parts of different dimensions, different relative permeability, Find total MMF. [5 Mark]
- b) Consider the following 2-D co-planer force system and find out the resultant & direction of the resultant draw vector diagram . [5 Mark]

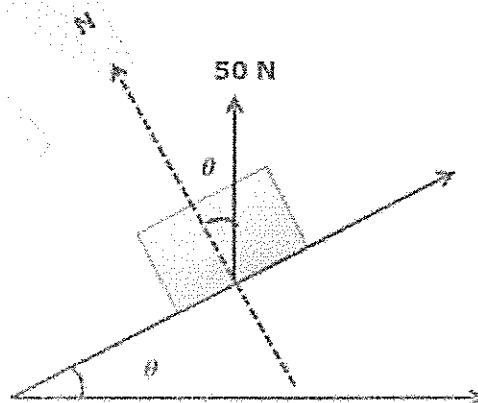


20 a) An electric iron operates from a 230V outlet and draws 8 amperes of current. At Rs. 4/KWh, how much does it cost to operate the iron for 2 hours? [5 Mark]

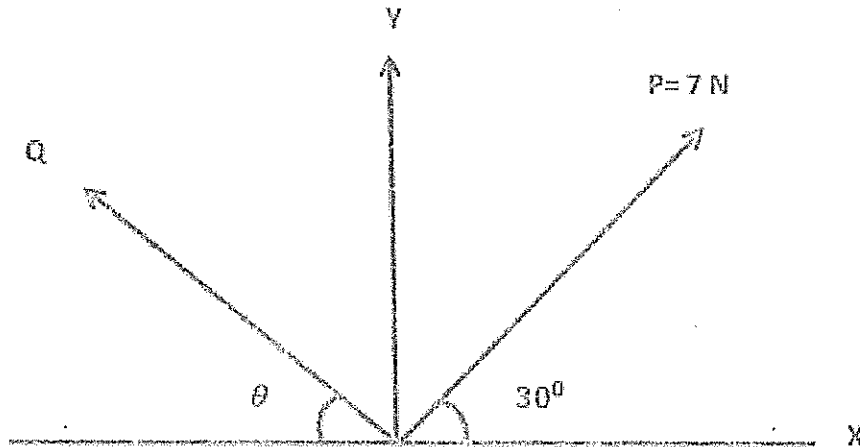
b) Explain angle of repose and angle of friction with sketch. State any four application of friction [5 Mark]

21 a) Find the magnetic field strength applied to a magnetic circuit of length 50cm when a coil of 400 turns is applied to it carrying a current of 1.2Amp. [5 Mark]

b) A block weighing 50 N just starts moving down a rough inclined plane when supported by a force of 20N acting parallel to the plane in upward direction. The same block is on the verge of moving up the plane when pulled by a force of 30N acting parallel to the plane. Find the inclination of the plane and coefficient of friction between the inclined plane and the block. [5 Mark]



22 a) The resultant of two forces P and Q is 15 N vertical. Determine the force Q and the corresponding angle θ for the system of forces as shown in Fig. (5 Marks)



b) State & explain basic law of electromagnetism used to induce EMF. (5Marks)

