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Question Paper Code: AHS007



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - December, 2016

Regulation: IARE – R16

APPLIED PHYSICS
(Common for AE/CE/ME)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Using a suitable diagram explain why when a dielectric is placed in a uniform electric field, the field within the dielectric weakens? [7M]
(b) A parallel plate capacitor having vacuum between the plates is charged such that the surface charge density on the plates is $8 \times 10^4 C/m^2$. If a dielectric is now inserted between the plates it is found that the surface charge density on the dielectric is $6 \times 10^4 C/m^2$. What is the dielectric constant of the material [7M]
2. (a) Draw a typical hysteresis curve for a ferromagnetic specimen and explain it using the domain theory. [7M]
(b) An empty solenoid having a current of 1A produces a magnetic field of 0.25T at a point along the axis outside the solenoid. If a specimen is now introduced inside the solenoid then the magnetic field at the same point on the axis of the solenoid is 25T. What is the susceptibility of the specimen? [7M]

UNIT – II

3. (a) State four factors affecting acoustics of an auditorium and give possible remedies [7M]
(b) A cubical hall of dimension L has a reverberation time T. If the size of the hall is shrunk so that the new dimension is $L/3$, what will be the change in the reverberation time? [7M]
4. (a) Describe how ultrasonic waves can be produced by the method of magnetostriction? [7M]
(b) A material of thickness t, Young's modulus Y and density d produces ultrasonic waves of frequency f. What will be the frequency of the ultrasonic waves produced by another material of thickness $t/2$, Young's modulus 3Y and density 2d in terms of frequency f. [7M]

UNIT – III

5. (a) Two coplanar forces A and B act at a point on a body. Assuming that the angle between the forces is θ , derive an expression for the resultant. If the resultant makes an angle α with the force A, write an expression for α . [7M]
- (b) A block of mass $M=15\text{kg}$ hangs by a cord from a knot K of mass m_k . This knot hangs from the ceiling by means of two cords A and B. If the magnitude of the gravitational force on the knot is negligible compared to the gravitational force on the block, calculate the tension in cord C given in figure 1. [7M]

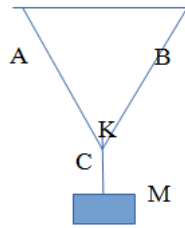


Figure 1

6. (a) A uniform horizontal bar is pivoted at its centre of mass. Two forces A and B at distances x_1 and x_2 of the centre (on either side of the centre) act down wards. What will be the ratio of x_1 to x_2 , if the bar is to remain horizontal? Explain your result. [7M]
- (b) Three concurrent forces act a point shown in figure 2. If $F_1 = 2\text{N}$, $F_2 = 3\text{N}$, find the magnitude of F_3 assuming that the point is in equilibrium. [7M]

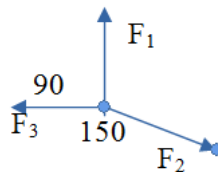


Figure 2

UNIT – IV

7. (a) What is friction explain the importance and nature of friction.Explain the coefficient friction. [7M]
- (b) A body slides along down a surface(with a uniform speed) that is inclined at an angle θ with respect to the horizontal. If the mass of the body is M and the coefficient of friction between the body and the surface is μ then derive a relationship between the coefficient of friction and the angle [7M]
8. (a) How to get solution of problems involving frictional forces with two good examples in detail. [7M]
- (b) A block weighing 10 KN is kept on a rough horizontal surface,the coefficient of static friction between the block and horizontal forces is required to start the block moving. [7M]

UNIT – V

9. (a) State perpendicular axis theorem. If the moment of inertia of a rectangular plate perpendicular to its length is $ML^2/12$ and perpendicular to the breadth is $MB^2/12$ then what is the moment of inertia about the axis passing through the centre of mass and perpendicular to the plane of the plate? [7M]
- (b) Obtain an expression for the radius of gyration of a rod of length L about an axis passing through one end of the rod and perpendicular to the length of the rod [7M]
10. (a) Explain the terms torque and angular momentum. Derive relation between torque and angular momentum. [7M]
- (b) The moment of inertia of a rectangular plate of mass 1 kg is $5 \times 10^{-4} \text{ kg m}^2$ about an axis passing through the centre and is perpendicular to the plane of the lamina. The moment of inertia about an axis passing through midpoint and length is $4 \times 10^{-4} \text{ kg m}^2$ Calculate the dimensions of the rectangular plate. [7M]