GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd EXAMINATION (New Syllabus) – WINTER 2013

Subject Code: 2110011 **Date: 26-12-2013**

Subject Name: Physics

Time: 10:30 am – 01:00 pm **Total Marks: 70**

Instructions:
1. **Question No. 1 is compulsory. Attempt any four out of remaining six questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **Objective Question**

(a) Choose an appropriate option from the following. **07**

1. According to Newton's second law of motion, acceleration is proportional to force. That means a larger force ……
  - (a) produce a smaller acceleration
  - (b) doesn't affect acceleration
  - (c) produces a smaller mass
  - (d) produces a larger acceleration

2. The weight of the body is due to ………..
  - (a) gravitational pull exerted by the earth
  - (b) forces experienced by body in atmosphere
  - (c) force of attraction experienced by particles
  - (d) gravitational force of attraction towards the center of the earth.

3. Which of the following is a vector quantity ………..
  - (a) energy (b) mass (c) momentum (d) speed

4. A force is completely defined when we specify ………….
  - (a) magnitude (b) direction (c) point of application (d) all of the above

5. Henry is the unit of………..
  - (a) capacitance (b) electrical energy (c) power (d) inductance

6. Fleming's left hand rule is used to find ………
  - (a) direction of magnetic field due to current carrying conductor
  - (b) direction of a flux in a solenoid
  - (c) direction of force on a current carrying conductor in a magnetic field
  - (d) polarity of a magnetic pole

7. Temporary magnets are used in ………
  - (a) loud speakers (b) generators (c) motors (d) all of the above

(b) Choose an appropriate option from the following. **07**
1. Which of the following represents the schematic symbol of zener diode?
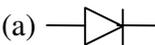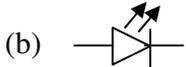
(a) ─▷├─ (b) ─▷├─ (c) ─▷├─ (d) ─▷├─

2. Which physical parameter is measured by Voltmeter?
  - (a) Current (b) Voltage (c) Resistance (d) Potential difference

3. The unit of inductance is ………………...
  - (a) Ohm (b) Mho (c) Farad (d) Henry

4. Calculate the effective resistance of the following combination.

      (a) 1.2Ω (b) 2.1Ω (c) 12Ω (d) 21Ω
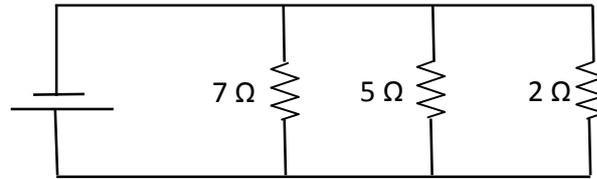
5. Oil has a smaller density than water. Therefore, an object that will float in oil will
    (a) float in water, with more of the object submerged.
    (b) float in water, with the same amount of the object submerged.
    (c) float in water, with less of the object submerged.
    (d) not float in water.

6. An object can float provided its _____ of the fluid.
    (a) mass is less than the mass   (b) mass is greater than the density
    (c) density is less than density   (d) density is less than mass.

7. Liquids transmit pressure equally in all the directions. This is according to…….
    (a) Boyle's law
    (b) Archimedes principle
    (c) Pascal's law
    (d) Newton's formula

Q.2 (a) (1) What are dielectric materials? Distinguish between a dielectric material and an insulator. What are the different types of dielectric materials? Explain them in detail. **04**

      (2) Describe the possible mechanism of polarization in a dielectric material. **03**

   (b) (1) Describe any two uses of dielectric material in detail. **02**

      (2) What are Shape Memory Alloys? Give some of its applications. **02**

      (3) Calculate the electronic polarizability of an isolated Se atom. The atomic radius of Se atom is 0.12 nm. (Given: $\varepsilon_0 = 8.85 \times 10^{-12}$) **03**

Q.3 (a) (1) Define magnetic materials. Classify diamagnetic, paramagnetic and ferromagnetic materials in detail giving their differences. **04**

      (2) Define and describe magnetic dipole, magnetic dipole moment and magnetic susceptibility. **03**

   (b) (1) Define and distinguish between hard and soft magnetic materials. **02**

      (2) What are the properties of metallic glasses? Mention some important applications. **02**

      (3) What are ferrites? Give properties and uses of ferrites. **03**

Q.4 (a) (1) Define and discuss the factors, reverberation, loudness, echelon effect and noise that affect the acoustics in a hall and the remedies for them. **04**

      (2) The Volume of a room is 1500 m². The wall area of the room is 260 m², the floor area is 140 m² and the ceiling area is 140 m². The average sound absorption coefficient for the wall is 0.03 sabine, for the ceiling is 0.8 sabine and for the floor is 0.06 sabine. Calculate the average absorption coefficient and reverberation time. **03**

   (b) (1) Describe any two characteristics of musical sound. **02**

      (2) What are biomaterials? Explain the different types of biomaterials and their applications in the medical field. **02**

      (3) Explain with neat circuit diagram the generation of ultrasonic waves by magnetostriction oscillator method. **03**

Q.5 **(a)** **(1)** Define superconductivity. Write definitions of the three important factors to define a superconducting state? Also, discuss few important properties of superconductors. **04**

(2) The critical temperature of the Nb is 9.15 K. At zero kelvin, the critical field is 0.196 T. Calculate the critical field at 6 K. **03**

(b) **(1)** Compare type-I and type-II superconductor. **02**

(2) What is solar cell? Discuss a few materials that are used in solar cell design. **02**

(3) Give applications of superconductivity mentioning josephson devices and magnetic levitation in detail. **03**

Q.6 **(a)** **(1)** Expand LASER. Describe the construction and working of Nd:YAG laser with a suitable energy-level diagram.. **04**

(2) Discuss the applications of lasers in various fields. **03**

(b) **(1)** Give difference between step index fiber and graded index fiber. **02**

(2) Briefly discuss fuel cells. **02**

(3) A step index fiber has a numerical aperture of 0.26, a core of refractive index 1.5 and diameter of 100µm. Calculate
(i) the refractive index of the cladding,
(ii) the acceptance angle, and
(iii) the maximum number of modes with a wavelength of 1µm that the fiber can carry. **03**

Q.7 **(a)** **(1)** Explain with neat sketch carbon nanotubes giving its structure, properties and applications. **04**

(2) Justify and give comments on, "At macro scale, the physical and chemical properties are not dependent on the size of the material, but at the nanoscale everything will change including colour, melting point and chemical properties." **03**

(b) **(1)** Define and describe 'surface to volume ratio' and 'quantum confinement effects'. **02**

(2) Give the difference between metallic and non-metallic glasses. **02**

(3) Give any six applications of nanomaterials. **03**

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