Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- Ist /IInd SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 110011 Date: 11/06/2012

Subject Name: Physics

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

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Each question carry equal marks**

Q.1 (A) Choose an appropriate option from the following.

i) Frequency range for ultrasonic sound wave is (1)

(a) < 2 Hz (b) 20Hz-20,000Hz (c) > 20 kHz (d) 2 Hz-10Hz

ii) The intensity level (I_L) of 0 dB corresponds to intensity of _____. (1)

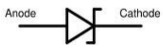
(a) 10^0 W/m^2 (b) 10^{-1} W/m^2 (c) 10^{-10} W/m^2 (d) 10^{-12} W/m^2

iii) 'Dwell Time' term is used in which of the following NDT method? (1)

(a) Liquid Penetrant (b) X-ray fluoroscopy (c) Pulse echo (d) none of these

iv) Which of the following represents the schematic symbol of Varactor diode? (1)

(a) 

(b) 

(c) 

(d) none of these

(B) Distinguish between type-I and type-II superconductors. (4)

(C) Answer the following question in detail.

i) Explain Holography technique. (3)

ii) An auditorium has a volume of 2000m^{3}and its total absorption is equivalent to 92.9 m^2 of Open window. What will be the effect on reverberation time if an auditorium is full of audience and thereby increasing the absorption by another 92.9 m^2 of Open window? (3)

Q.2 (A) Write down properties and applications of ultrasonic waves. (4)

(B) Define:-Atomic Packing Factor and void space. Find APF (%) and void space for Face Centered Cubic structure. (5)

(C) What is NDT? Explain X-ray radiography method for NDT. (5)

Q.3 (A) Answer the following questions.

i) Justify the statement; 'Zener Diode' is used as voltage regulator in electronic circuit. (2)

ii) Elaborate the statement, Lattice + Basis=Crystal Structure. (2)

iii) The refractive indices of the core and the cladding materials are 1.55 and 1.51 respectively. Calculate the numerical aperture of the optical fibre made from these materials. (2)

(B) Explain advantages of Optical fibre over a conventional metallic cable. (4)

(C) Derive an expression for thermal conductivity of metals by making use of kinetic theory of gases. (4)

Q.4 (A) State the differences between laser light and ordinary light. (3)

(B) Obtain an expression for interplanar distance between two adjacent planes of Miller indices (h k l) in a cubic crystal system. (5)

(C) Classify optical fibre based on refractive index profile and modes of propagation. (6)

Q.5 (A) Answer the following in short.

i) What is piezoelectric effect? (1)

ii) Define: Total Internal Reflection. (1)

iii) Write down the statement of Ohm's law. (1)

iv) Draw the crystal plane for the Miller Indices (1 1 1) in a simple cubic unit cell. (1)

(B) Solve the following numerical.

The critical magnetic field at 5 K is $2x10^3$ A/m in a superconducting ring of radius of 0.02 m. find out the value of critical current. (3)

(C) Answer the following in detail. (7)

What is metallic glass? Explain melt spinning method for the preparation of metallic glass. State properties and applications of Metallic glass.

Q.6 (A) Show that Superconducting material is diamagnetic in nature and obtain $\chi_m = -1$. (4)

(B) Write a Short note of Fullerene and Carbon Nano Tube. (5)

(C) Describe the principle, construction and working of Nd: YAG laser. (5)

Q.7 (A) Answer the following.

i) Classify solid on the basis of energy band diagram. (3)

ii) The Hall effect co efficient of a specimen of doped silicon is found to be $3.66x10^{-3}$ m^3/C. The resistivity of the specimen is $8.93x10^{-4}$ Ω-m. Find out the mobility and carrier concentration of the charge carrier. (3)

(B) State and explain Wiedemann- Franz law. What is an outcome of this law? (4)

(C) Derive an expression for total sound energy received by a wall segment per unit second in form of $\frac{E \cdot v \cdot ds}{4}$. (4)

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