Seat No. : _____

NF-120

December-2015

B.Sc., Sem.-V

Physics/Electronics (Elective)

(Nano-science and Nano technology)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) **All** questions carry equal marks.

(2) Numbers on the right side of questions indicate marks.

1. (a) What do you mean by hardness of material ? Give the names of different scales to measure hardness. Give the comparison of hardness and grain size in the case of micrometer size grain and nano meter size grain. **7**

OR

Explain elastic properties of common materials. How plastic deformation in nano-crystalline materials differs from that of polycrystalline bulk counterpart ?

(b) Can nano particles be considered as metals ? Explain Coulomb blockade and Staircase for a quantum dot. **7**

OR

Explain the Drude model for free electron gas and discuss the phenomena of Surface Plasma Resonance.

2. (a) Write a short note on Characterization of semiconductor nano particle. **7**

OR

Giving schematic diagram discuss how materials are synthesized by sol gel method.

(b) Write a note on the synthesis of nano particles by Physical Vapour Deposition method. **7**

OR

Write a note on the synthesis of nano particles by Chemical Vapour Deposition method (CVD).

3. (a) What do you mean by Chiral tube ? Explain different types of Carbon Nano tubes ? Highlight the properties of the Carbon Nano tubes. **7**

OR

Write a detailed note on Fullerene.

(b) Describe the construction and working of Scanning Electron Microscope (SEM). **7**

OR

What is difference between scanning electron microscope (SEM) and transmission electron microscope (TEM) ? How do you characterize a material with transmission electron microscope (TEM) ?

4. (a) Write a note on synthesis of carbon nano tubes. **7**

OR

Explain Atomic scattering factor. Derive Bragg's law of Diffraction for X-rays.

(b) Write a note on Photoluminescence. **7**

OR

Explain how the nanotechnology is important to us.

5. Answer the following short questions : **14**

(1) What do you mean by plastic deformation ?

(2) Define bulk modulus.

(3) What do you mean by quantum dot ?

(4) What do you mean by Plasmons ?

(5) What is Frenkel exciton ?

(6) Define Cathodominescence.

(7) What do you mean by themoluminescence ?

(8) What are diamagnetic materials ?

(9) Define magneto resistance.

(10) What is Fullerite ?

(11) What do you mean by Chiral vector R ?

(12) Define top down approach.

(13) Give two examples of uses of nanostructures from earlier times.

(14) Find the surface area to volume ratio for two spheres with radii 20 cm and 10 cm.

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Seat No. : _____

NF-120

December-2015

B.Sc., Sem.-V

Physics/Electronics

(Object Oriented Programming in C++)

Time : 3 Hours] **[Max. Marks : 70**

1. (a) Explain the basic structure of Object Oriented Programming C++. **7**
   (b) Write a program to print first 10 natural numbers. **7**

   OR

   (a) Write the all basic data types of C++.
   (b) Write a program to find average of two numbers.

2. (a) Explain the Public Member Function with suitable example. **7**
   (b) Write a program to evaluate the following equation/series :
   $x = 1 + x \text{ ^ } 1/1 \text{ ! } + x \text{ ^ } 2/2 \text{ ! } + x \text{ ^ } 3/3 \text{ ! } + \ldots\ldots$ **7**

   OR

   (a) Write special characteristics of *Constructors.*
   (b) Write a program display string.

3. (a) Write a note on *Destructors.* **7**
   (b) Write a program to for arithmetic operator overloading. **7**

   OR

   (a) Explain Function Overloading.
   (b) Write a program for Arithmetic Operator (+) Overloading to add time in hours and minutes.

4. (a) Explain the Classes for file stream operations. **7**
   (b) Write a program to calculate sum of 100 numbers. **7**

   OR

   (a) Use of iostream header file.
   (b) Write a program to display all two digited even numbers.

5. QUIZ : **14**
   (1) _____ character is used to specify single comment line.
   (2) _____ Identifier is used for real value.
   (3) One or more loop inside any other loop is called _____.
   (4) Variable define inside a function is called _____.
   (5) cout object from _____ header file.
   (6) Boolean operator has only _____ value.
   (7) All _____ functions must be defined before they are called.

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Seat No. : _____

NF-120

December-2015

B.Sc., Sem.-V

(Electronics Only)

(Consumer Electronics)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) Figures to the right indicate marks.
(2) Symbols used here have their usual meanings.

1. Answer any **two** of the following : **20**
   (a) Enlist any two features of the ideal loud speaker. Explain moving coil loud speaker in detail.
   (b) What are the characteristics of microphones ? The plates of a condenser microphone have a diameter of 12 cm. The separation between plates varies from 0.0025 cm to 0.005 cm, depending on sound pressure. Find the capacitance for the two positions.
   (c) Explain the working principle of condenser microphone.
   (d) Write short note on : Electro-dynamic loudspeaker.

2. Answer any **two** of the following : **20**
   (a) Why scanning is required ? Explain interlace scanning in detail.
   (b) Draw and explain block diagram of Monochrome Television.
   (c) Write a note on Monochrome TV camera.
   (d) Explain the working of monochrome picture tube.

3. Answer any **two** of the following : **20**
   (a) Briefly explain the evolution of video disc.
   (b) Write a note on solid state LASER.
   (c) Explain the recording and playback system of an optical video disc.
   (d) Compare different types of video disc systems.

4. Answer the following in **a sentence or two** : **10**
   (a) What is a microphone ?
   (b) What are the limitations of crystal microphones ?
   (c) A loudspeaker converts _____ energy to _____ energy.
   (d) What are tweeters ?
   (e) What is aspect ratio for an image ?
   (f) Write the full form of NTSC.
   (g) Why are discs for NTSC television system and for SECAM television system not interchangeable ?
   (h) Define the carrier frequency.
   (i) Write the full form of LASER.
   (j) Where Tellurium-Selenium alloy is used ?

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