

Seat No. : _____

N17-136

November-2014

B.Sc., Sem.-V (CBCS Semester System)

(Common for Physics & Electronics)

Physics-305 : Nano Science and Nano Technology (Elective)

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) All questions carry equal marks.
(2) Numbers on right side of questions indicate marks.

1. (a) What is nano science ? Explain how surface area to volume ratio is important for nano materials. 7

OR

Explain elastic properties of common materials. How plastic deformation in nanocrystalline 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 optical properties of metallic nano particles. Define coefficient of extinction. Which condition gives rise to strong resonance band ?

2. (a) Discuss the mechanical ball milling method to synthesize nano materials. 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 vapor deposition method. 7

OR

Discuss the Laser vaporization (ablation) method. Give the salient feature of this method.

3. (a) What are Carbon Nano tubes ? Explain different types of Carbon nano tubes. Highlight the properties of the Carbon Nano tubes. 7

OR

Write a detailed note on bucky-ball.

- (b) Write a note on synthesis of carbon nano tubes. 7

OR

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

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4. (a) Write a note on Transmission electron microscope (TEM).

7

OR

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

- (b) Describe the diffraction from nano particles. Explain the effect of crystal size on the diffraction and derive Scherrer's equation.

7

OR

Explain how the nanotechnology is important to us.

5. Answer the following short questions :

14

- (1) What do you mean by hardness of the materials ?
- (2) Define young modulus.
- (3) What do you mean by quantum dot ?
- (4) What do you mean by Plasmons ?
- (5) What is Mott-Wannier exciton ?
- (6) Define electroluminescence.
- (7) What do you mean by after glow ?
- (8) What are ferromagnetic materials ?
- (9) Define magneto resistance.
- (10) What is Fullerene ?
- (11) What are carbon nanobuds ?
- (12) Define bottom up 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 10 cm and 5 cm.

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B.Sc., Sem.-V

(Common for Physics & Electronics) 305

Object Oriented Programming in C++

Time : 3 Hours]

[Max. Marks : 70

1. (a) Write the use of Object Oriented Programming C++ in different areas. 7
(b) Write a program to evaluate the following equation/series : 7
 $\cos(x) = 1 - x^2/2! + x^4/4! - x^6/6! + \dots$

OR

 - (a) Explain all the logical operators use in C++.
 - (b) Write a program to convert temperature in Fahrenheit to Celsius.
2. (a) Explain the types of Data Member. 7
(b) Write a program to input data and display with class and objects. 7

OR

 - (a) Write short note constructors.
 - (b) Write a program to add data in inch and foot format.
3. (a) Write the note on member operator function. 7
(b) Write a program to add three numbers and calculate average. 7

OR

 - (a) Write the note on Function Overloading.
 - (b) Write a program for Arithmetic Operator (+) Overloading to add time in minutes and seconds.
4. (a) Explain the C++ files and Streams. 7
(b) Write a program to Display string in triangle "OPERATORS". 7

OR

 - (a) Explain how to read text file.
 - (b) Write a program to print First 10 Numbers.
5. Fill in the Blanks : 14
 - (i) Default extension of c++ program is _____.
 - (ii) _____ identifier is used for integer value.
 - (iii) _____ identifier is used for character value.
 - (iv) Member functions defined outside a class are must used _____ operator.
 - (v) Multiple lines remark statement represent by _____ characters.
 - (vi) A function designed as _____ can be accessed like any other ordinary functions.
 - (vii) Cout object from _____ header file.

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November-2014

B.Sc., Sem.-V

For Electronics only

ELE-305C : Consumer Electronics

Time : 3 Hours]

[Max. Marks : 70

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

1. Answer any **two** of the following : 20
 - (a) Give brief classification of microphone. Explain moving coil microphone in detail.
 - (b) Write a note on condenser microphone. 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 Horn loudspeaker.
 - (d) What are woofers and tweeters ? What is the difference between them ? Draw a cross-over circuit and explain its working.
2. Answer any **two** of the following : 20
 - (a) Why scanning is required ? Enlist the types of scanning. Explain interlace scanning in detail.
 - (b) What are the elements of television system explain them briefly with the help of block diagram.
 - (c) Write a note on composite video signal.
 - (d) Explain the working of monochrome picture tube.
3. Answer any **two** of the following : 20
 - (a) Briefly explain the different video disc formats.
 - (b) Write a note on video disc mastering and replication.
 - (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 loudspeaker ?
 - (b) Why woofers and tweeters are needed ?
 - (c) Where crystal microphones are used ?
 - (d) What is the principle of electro-dynamic loudspeaker ?
 - (e) What is scanning of 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 sideband frequency.
 - (i) Write the full form of LASER.
 - (j) Give any two types of different optical recording mediums.

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November-2017

B.Sc., Sem.-V

305 : Physics

(Nano Science & Nano Technology)

Time : 3 Hours]

[Max. Marks : 70

- Instructions :**
- (1) All questions carry equal marks.
 - (2) Symbols have their usual meaning.
 - (3) Number on the right side of question indicate marks.

1. (a) Discuss in brief about Excitons. 7

OR

Explain coulomb blockade and staircase for a quantum dot.

- (b) Describe the effect of reducing the size from bulk to nano dimension with examples. 7

OR

Define 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 nanometer size grain.

2. (a) Using a neat schematic diagram, explain physical vapour deposition (PVD) method to synthesis nano-materials. 7

OR

Explain Chemical Vapour Deposition (CVD) method to synthesis nano-materials.

- (b) Describe about the structure of Carbon Nanotubes. 7

OR

Discuss synthesis of Colloids.

3. (a) Write a detailed note on the structure of fullerenes.

OR

Describe the construction and working of scanning Electron Microscope. (SEM).

- (b) What are Carbon nano-tubes ? Describe about the formation of carbon nano-tubes.

OR

Derive Bragg's law for diffraction of X-rays.

4. (a) Write a note on Photo luminescence.

OR

Discuss applications of nano technology in Electronics.

- (b) State difference between Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). How a material is characterised with Transmission Electron Microscope (TEM) ?

OR

Discuss applications of nano-technology in domestic appliances.

5. Answer the following in Short : (Each of 1 mark)

- (1) What is nano meter scale ?
- (2) Define Quantum dot.
- (3) Define Frankel excitons.
- (4) What is plastic deformation ?
- (5) Define Plasmons.
- (6) State main principles involved in the luminescent property of nano-materials.
- (7) Define Super paramagnetic particles.
- (8) State types of mills used in High Energy Ball Milling method.
- (9) What is Fullerite ?
- (10) State curie law for paramagnetic substances.
- (11) Define Colloids.
- (12) State types of Carbon Nano-Tubes. (CNT).
- (13) Give one disadvantage of SEM.
- (14) What is Cathode luminescence ?

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November-2017

B.Sc., Sem.-V

305 : Physics

(Programming in C++ (Part C))

Time : 3 Hours]

[Max. Marks : 70

- Instructions :**
- (1) Attempt all questions.
 - (2) Symbols used here have their usual meanings.
 - (3) Number on the right side of question indicate marks/

- (a) Write basic structure of Object Oriented Programming C++. 7
- (b) Write a program to convert and display temperature in Fahrenheit to Celsius. 7

OR

- (a) Write the all basic data types of C++.
- (b) Write a program to input data and display with class and objects.

2. (a) Explain the friend Function with suitable example. 7
- (b) Write a program to evaluate the following equation/series : 7

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!}$$

OR

- (a) Write the note on dynamic Constructors.
- (b) Write the rules for Functions Overloading.

3. (a) Write the note on Destructors. 7
- (b) Write a program to add distance data in metres and Kilometres format. 7

OR

- (a) Write the note on Overloading Operators.
- (b) Write a program for Arithmetic Operator (-) Overloading to Subtract distance Centimeter.

4. (a) Write a note on Exception Handling in C++. 7
(b) Write a program to display string in triangle "COMPUTER". 7

OR

- (a) Write uses of C++ in Education.
(b) Write a program to add amount data in rupees and paise format.

5. (i) a class call a _____ data type. 14
(ii) _____ operator is called scope resolution operator.
(iii) tin object from _____ header file.
(iv) pow() from _____ header file.
(v) clrscr() from _____ header file.
(vi) Single line remark statement represent by _____ characters.
(vii) _____ identifier is used for character value.

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November-2017

B.Sc., Sem.-V

**Elective - 305 : Electronics
(Consumer Electronics)**

*chemical vapor distib.
Laser dis
carbon arc-dis*

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) Attempt all questions.
(2) Symbols used here have their usual meanings.

1. Answer any **two** of the following :

20

- (a) With block diagram explain principle, working & features of Condenser Microphone.
- (b) Explain Moving Coil Microphone in detail.
- (c) With block diagram explain principle, working & features of Horn Loudspeaker.
- (d) Draw & explain working of Cone Type Loudspeaker. Give its advantages & disadvantages.

2. Answer any **two** of the following :

20

- (a) With block diagram explain Horizontal and Vertical Scanning in detail.
- (b) Discuss about Black and White Picture tube in detail.
- (c) Explain the significance of carrier frequency and side band frequency.
- (d) Explain Persistence of Vision and Aspect Ratio in detail.

3. Answer any **two** of the following :

20

- (a) Explain in detail about Optical Recording Medium and Video Disc.
- (b) Discuss Solid State LASER in detail.
- (c) Give Video Disc System Comparison in detail.
- (d) Write a short note on Optical Memory Disc.

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4. Answer the following :

- (1) A _____ is a transducer which converts variations of sound pressure into electrical signals of the same frequency.
- (2) Give disadvantages of Ribbon Microphones.
- (3) If size of the baffle is much larger than half the wave length, it is known as _____ baffle.
- (4) Define : Directivity.
- (5) Give full form of NTSC.
- (6) Write the full form of UHF.
- (7) Kell factor varies from 0.65 to _____.
- (8) The emf produced during horizontal retrace time is known as _____ emf.
- (9) Explain the use of Tellurium-Selenium Alloy.
- (10) Give full form of LASER.