B.Sc. Semester-VI Examination, 2022-23

PHYSICS [Honours]

Course ID : 62417 Course Code : SH/PHS/604/DSE-4/T-4

Course Title : Nano-Materials and Application

Time : 1 Hour 15 minutes Full Marks : 25

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.

SECTION–I

1. Answer any **five** questions: 1×5=5

   a) Name any two processes through which the large surface energy destroys the nanostructures.

   b) Write two advantages of SOL-Gel synthesis method.

   c) How does the magnetic property of ferromagnetic nanoparticles depend upon its particle size?

   d) What is thermionic emission?

   e) Why do the core-shell composite nanomterials possess better optical properties compared to the individual nanomaterials?

   f) Indicate four applications of nanoscience and nanotechnology in the diversified fields of science.

   g) What is the importance of considering higher angle (2θ) reflections, while analysing XRD patterns?

   h) What do you mean by Hopping conduction?

SECTION–II

2. Answer any **two** questions: 5×2=10

   a) Mention some important effects observed due to quantum confinement. N numbers of spherical nanoparticles, each of radius r, are fused into a single spherical nanoparticle of radius R. How does the surface to volume ratio change due to this conversion? 3+2

   b) What is physical vapor deposition [PVD]? Name four different synthesis techniques those are included in this group of synthesis. 3+2

   c) What are the problems with conventional solar cells? Describe the structure of QD solar cell with necessary diagram. 1+(1+3)

d) How structural purity of a nanomaterial can be studied using X-ray diffraction data? Explain the principle of estimating particle size from X-ray diffraction data. 2+3

SECTION–III

3. Answer any **one** question: 10×1=10

a) What are the different types of defects that can be seen in crystals? Mention the point defects that can be found in nanostructured materials. What do you mean by deep and shallow levels? 3+3+(2+2)

b) i) Why is spatial resolution of STM better than AFM?

ii) Show that in STM the tunnelling current varies exponentially as the tip-sample distance.

iii) Write down the similarities and differences between thermal evaporation and e-beam evaporation techniques.

iv) What is the role of capping agent in nano-synthesis? 2+3+4+1

B.Sc. Semester-VI Examination, 2022-23

PHYSICS [Honours]

Course ID : 62417 Course Code : SH/PHS/604/DSE-4/T-8

Course Title : Communication Electronics

Time : 1 Hour 15 minutes Full Marks : 25

The figures in the right-hand margin indicate marks. Candidates are required to give their answers in their own words as far as practicable.

SECTION–I

1. Answer any **five** questions: 1×5=5

a) Discuss the advantages of SSB-SC signals? Write down the value bandwidth of SSB-SC.

b) What is IMEI number? Discuss its importance.

c) Describe generations of mobile communication.

d) What do you understand by the Pulse Code Modulation?

e) Discuss the advantages of geostationary satellites.

f) Define the term signal to noise ratio.

g) Define Transmission efficiency in AM wave.

h) What do you understand by image frequency and its rejection?

SECTION–II

2. Answer any **two** questions: 5×2=10

a) Draw a simplified block diagram of Earth station for satellite communication. Explain the role of transponder in satellite communication. 2+3

b) Briefly discuss the concept of PAM and PWM. Explain the processes with diagram. 2+3

c) What do you understand by Frequency modulation and Phase modulation? Illustrate the differences between them in table format. 2+3

d) Explain the principle of operation of envelope detector. 5

SECTION–III

3. Answer any **one** question: 10×1=10

a) Discuss the concept of the following terms:

i) Amplitude Shift Keying (ASK)

ii) Frequency Shift Keying (FSK)

iii) Phase Shift Keying (PSK)

iv) Binary Phase Shift (BPSK) 2.5×4=10

b) What is uplink and downlink frequency? Briefly discuss the GPS navigation system. Explain why reception for High frequency band is better during night time. 2+3+5

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