

SC - 802

Total No. of Pages : 3

Seat No.	
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**First Year B. Tech. (All Branches) (Semester - I&II)  
(New) (CBCS) Examination, November - 2019  
ENGINEERING PHYSICS**

**Sub. Code: 71811**

**Day and Date : Saturday, 30 - 11 - 2019**

**Total Marks : 70**

**Time : 2.30 p.m. to 5.00 p.m.**

- Instructions :**
- 1) Attempt any three questions from each question.
  - 2) Figures to the right indicate full marks.
  - 3) Given:- Avogadro's number  $=6.02 \times 10^{26}/\text{kg.atom}$   
Planck's constant  $h=6.626 \times 10^{-34} \text{ J.s}$   
Electronic charge  $e=1.6 \times 10^{-19} \text{ C}$   
Electron mass  $m=9.1 \times 10^{-31} \text{ kg}$

**SECTION-I**

**Q1) Answer the following questions.**

- a) Discuss the theory of plane diffraction grating for normal incidence. [6]
- b) i) How many orders will be visible if the wavelength of incident light is  $5000 \text{ \AA}$  and number of lines per inch on the grating is 2620. [3]  
ii) Calculate the specific rotation, if the plane of polarization is turned through  $26.25^\circ$  travelling 20 cm length of 20% sugar solution. [3]

**Q2) Answer the following questions.**

- a) What is laser? Explain construction and working of ruby laser with necessary diagram. [6]
- b) What are the important applications of laser? [5]

**Q3) Answer the following questions.**

- a) Mention the basic requirements of acoustically good auditorium. [5]
- b) i) Define:- Reverberation, reverberation time and absorption coefficient. [3]  
ii) A picture hall has a volume of  $8000 \text{ m}^3$ . It is required to have reverberation time of 1.5 sec. What should be the total absorption in the hall? [3]

**P.T.O.**

Q4) Answer any two from the following questions.

- a) Define specific rotation. Describe construction of Laurent's half shade polarimeter. Explain how you will use it to determine the specific rotation of sugar solution. [6]
- b) Draw block diagram of fibre optic communication system and explain function of each block. [6]
- c) Give an account of the bad acoustical properties of some hall. Discuss the methods for remedying these defects. [6]

### SECTION-II

Q5) Answer the following questions.

- a) Discuss the parameters (axial lengths, interfacial angles, Bravais lattices and example) of any three crystal systems with diagrams. [6]
- b) Derive Bragg's relation for X-ray diffraction with necessary diagram. [6]

Q6) Answer the following questions.

- a) Explain construction and working of Atomic Force Microscope. [6]
- b) Define the nanoscience. Explain in detail Colloidal technique used for synthesis of nanomaterial. [5]

Q7) Answer the following questions.

- a) X-rays of wavelength  $0.02 \text{ \AA}$  are scattered from a block of graphite. The scattered X-rays are observed at an angle of  $45^\circ$  to the incident beam. [6]
  - i) Calculate wavelength and energy of the scattered x-rays at this angle.
  - ii) Compute the energy of a recoiled electron.
- b) Discuss the De-Broglie's concept of matter wave. Obtain the formula for wavelength of matter wave in terms of potential difference 'V' used to accelerate the particle. [5]

Q8) Answer any two from the following questions.

- a) Sodium crystallizes in a cubic lattice. The edge of the unit cell is  $4.3 \text{ \AA}$ . The density of Na is  $963 \text{ kg/m}^3$ , its atomic weight is 23. How many atoms are contained in one unit cell? What type of cubic unit cell does Na form? Find the atomic radius. [6]
- b) State and discuss any three properties of nanomaterials. [6]
- c) State and explain Heisenberg's uncertainty principle for position and momentum of the particle. [6]

