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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 \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° 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 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 \AA are scattered from a block of graphite. The scattered X-rays are observed at an angle of 45° 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 \AA . The density of Na is 963 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]**

