SV-2

Seat No.	

Total No. of Pages : 3

F.E. (All Branches) (Part-I) (Semester - I & II) (New) Examination, April - 2018
ENGINEERING PHYSICS
Sub. Code : 59176/59932

Day and Date : Thursday, 26 - 4 - 2018 **Total Marks : 100**
Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Given:-

Avogadro's number	=	6.02×10^{26}/kg.atom
Planck's constant h	=	6.626×10^{-34} J.s
Electronic charge e	=	1.6×10^{-19} C
Electron mass m	=	9.1×10^{-31} kg

SECTION-I

Q1) Attempt any three from the following questions:

a) Define resolving power of grating and Derive an expression for resolving power of Grating. [6]

b) What is double refraction? Give Huygen's theory of double refraction in uniaxial crystal. Distinguish between positive and negative crystals. [6]

c) Write note on photoelasticity. [5]

d) A diffraction grating used at normal incidence gives a yellow line ($\lambda = 6000A°$) in a certain order superimposed on a blue line ($\lambda = 4800A°$) of next higher order. If the angle of diffraction is $\sin^{-1}(3/4)$, calculate the grating element. [5]

Q2) Attempt any three from the following questions:

a) What is holography? Explain recording and viewing of hologram. [6]

b) Explain different types of optical fiber. [6]

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c) i) Explain the term population inversion. [2]

ii) State and explain any three characteristics of laser. [3]

d) i) Define:- acceptance angle, Numerical aperture. [2]

ii) A step index fiber has a numerical aperture 0.26, a core refractive index of 1.5.

Calculate the refractive index of cladding and angle of acceptance. [3]

Q3) Attempt any three from the following questions:

a) With neat diagram explain the function of moderator, reflector, coolant and control rods for a nuclear reactor. [6]

b) Write note on nuclear fission as a source of energy. [5]

c) Explain Carbon - Nitrogen cycle of stellar thermonuclear reactions. [5]

d) i) Distinguish between nuclear fission and nuclear fusion. [2]

ii) Define:- Multiplication factor, critical size, critical ignition temperature. [3]

SECTION-II

Q4) Attempt any three from the following questions:

a) Define atomic radius and calculate atomic radius for SC, BCC and FCC lattice crystal. [6]

b) Explain centre of symmetry and Plane of symmetry in a cubic crystal system. [6]

c) Derive Bragg's law of X-ray diffraction with necessary diagram. [5]

d) i) Draw the planes in cube (101) and (100). [2]

ii) Atomic radius of BCC crystal is 10^{-8} cm. What will be the volume of unit cell. [3]

Q5) Attempt any three from the following questions:

a) Discuss the wave particle duality of light. Derive an expression for de Broglie wavelength of matter wave in the form of kinetic energy E. **[6]**

b) State and explain Heisenberg's uncertainty principle with suitable example. **[6]**

c) Explain the properties of matter waves. **[5]**

d) Photon of initial energy 90 keV undergoes Compton scattering at an angle 60°. Find the energy of scattered photon and recoil energy of the electron. **[5]**

Q6) Attempt any three from the following questions:

a) Explain construction and working of Scanning Tunneling Microscope with neat diagram. **[6]**

b) Describe concept of top down and bottom up approach used in synthesis of nanomaterials. **[5]**

c) What are carbon nanotubes? Explain the types of CNT. **[5]**

d) Discuss different applications of nanomaterials. **[5]**

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