



SLR-TX – 5

Seat No.	
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Set	P
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**F.E. (Part – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday 12-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, if **necessary**.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol.}$
 - 2) Velocity of light, $c = 3 \times 10^8 \text{ m/sec.}$
 - 3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C.}$

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The number of atoms in a primitive cell is
a) 1 b) 3 c) 2 d) 4
- 2) Ultrasonic waves have frequency
a) As that of audible range
b) Above audible range
c) Below audible range
d) Below as well as above audible range
- 3) Void space =
a) $(1 + \text{APF}) \times 100$ b) $(1 - \text{APF}) \times 100$
c) $(1 + \text{APF})/100$ d) $(1 - \text{APF})/100$
- 4) At 0K, in semiconducting material
a) Conduction band is full
b) Conduction band is partially filled
c) Valence band is empty
d) Conduction band is empty

P.T.O.



- 5) When a body of rest mass 10 kg moves with velocity of light, its mass becomes
a) 0 b) 20 kg c) ∞ d) 100 kg
- 6) In conductor, current flows due to
a) Holes b) Both holes and electrons
c) Protons d) Electrons
- 7) The absorption coefficient is measured in
a) WOU b) m/s^2 c) OWU d) m^2
- 8) The resolving power of grating having N slits in n^{th} order will be
a) $(n + N)$ b) $(n - N)$ c) $n N$ d) n/N
- 9) Optically active substances are those substance which
a) Produce polarized light
b) Rotate the plane of polarization of polarized light
c) Produce double refraction
d) Convert a plane polarized light into circularly polarized light
- 10) For He-Ne laser, typical value of divergence is
a) 10^5 radian b) 10^{-5} radian c) 10^3 radian d) 10^{-3} radian
- 11) The value of fractional refractive index change is always
a) >1 b) <1 c) $=1$ d) $=0$
- 12) If the multiplication factor is greater than unity in a nuclear fission reaction involving neutron capture, then
a) An explosion may result
b) Explosion cannot occur
c) Process will stop after sometime
d) There will be no chance for explosion
- 13) Coolant is used in nuclear reactor
a) To slow down the fast neutrons
b) To absorb excess neutrons
c) To increase speed of neutrons
d) To transfer the energy from core to heat exchanger
- 14) The tubes whose mirror images are similar as the original structure are
a) Chiral tubes b) Achiral tubes
c) Carbon tubes d) None of these
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SECTION – I

2. Attempt **any five** of the following **15**
- a) Define atomic packing factor. Calculate atomic packing factor for SC and BCC.
 - b) What are valence band, conduction band and energy gap ? Show with neat diagram.
 - c) Explain : Length contraction.
 - d) The volume of room is 1600 m^3 . The wall area of the room is 270 m^2 , the floor area is 150 m^2 and ceiling area is 140 m^2 . The average sound absorption coefficient for wall is 0.03, for the ceiling is 0.8 and for the floor is 0.06. Calculate the average absorption coefficient and the reverberation time.
 - e) State the acoustic requirements of a good auditorium.
 - f) Find the Miller indices of a set of parallel planes, which makes intercepts in the ratio $3a : 4b$ on the x and y axes and are parallel to z-axis where a, b and c being primitive vectors of the lattice.
 - g) Explain : Seven crystal systems.
3. Deduce an expression for Lorentz transformation equation and its inverse. **5**

OR

Explain Hall effect. Derive the relation for Hall voltage V_H and Hall coefficient R_H in detail.

Set P



4. Attempt **any two** of the following 8
- a) Explain effect of impurity concentration on the position of Fermi level in P type semiconductor.
 - b) Explain : Plane of symmetry.
 - c) Describe various methods used for detection of ultrasonic.
 - d) Deduce Einstein's expression ($E = mc^2$) for mass-energy equivalence.

SECTION – II

5. Attempt **any five** of the following : 15
- a) Write characteristics of LASER beam.
 - b) Explain the terms : optically activity and specific rotation.
 - c) Explain : principle of fiber optics.
 - d) Explain : Classification of optical fiber.
 - e) Give application of nanotechnology in different fields.
 - f) Calculate power output of reactor, which consumes 2kg of U-235 per day. Assume 7% reactor efficiency. Energy released per fission is 200 MeV.
 - g) A parallel beam of monochromatic light is incident normally on plane transmission grating having 15000 lines per inch. The first order spectrum is observed to be deviated through an angle 21.7° from normal. Calculate the wavelength of light used.
6. What is LASER ? Why semiconductor laser is called injection laser ? Explain with energy and emission diagram, construction and working of semiconductor laser. 5

OR

Deduce the expression for acceptance angle and numerical aperture of optical fiber and explain how it can be calculated with the help of fractional refractive index change.

7. Attempt **any two** of the following : 8
- a) What is resolving power ? Explain Rayleigh's criterion of resolution.
 - b) Describe Laurent's half shade Polarimeter for the determination of specific rotation of the substance.
 - c) Explain essentials of nuclear reactor.
 - d) Explain : Holography.

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MCQ/Objective Type Questions

Duration : 30 Minutes

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1. Choose the correct answer :

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a) $(n + N)$ b) $(n - N)$ c) $n N$ d) n/N
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a) Produce polarized light
b) Rotate the plane of polarization of polarized light
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- 3) For He-Ne laser, typical value of divergence is
a) 10^5 radian b) 10^{-5} radian c) 10^3 radian d) 10^{-3} radian
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a) >1 b) <1 c) $=1$ d) $= 0$
- 5) If the multiplication factor is greater than unity in a nuclear fission reaction involving neutron capture, then
a) An explosion may result
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P.T.O.



- 6) Coolant is used in nuclear reactor
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 - g) Explain : Seven crystal systems.
3. Deduce an expression for Lorentz transformation equation and its inverse. **5**

OR

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Set Q



4. Attempt **any two** of the following 8
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