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Even Semester Examination 2023 (Backlog)

Paper Name: Elementary Physics

Time: 3 Hours

Paper Code: BCA-204

Maximum Marks: 75

Section A

Attempt ALL Questions

(1 × 35 = 35)

Q.No.	Questions	CO	BL
1	Electrons are minority carriers and trivalent atoms are dopants in an n-type semiconductor. True/False?	5	1
2	The p-type semiconductor is electrically neutral. True/False?	5	1
3	Stimulated emission is maximized in a laser operation. True/False?	3	1
4	In an LED, p-n junction is reverse biased. True/False?	5	2
5	In SI units, the value of electronic charge, $e =$	2	1
6	Three resistors $1.5\ \Omega$, $2.5\ \Omega$ and $4\ \Omega$ are connected in series. The total resistance of the combination is Ω .	2	2
7	Force is needed to keep a moving body in motion. True/False?	1	1
8	Metastable state is a short lived state. True/False?	3	1
9	In optical fiber, the refractive index of a core is greater than the refractive index of a cladding. True/False?	4	2
10	Energy bandgap of an insulator is smaller than that of a semiconductor. True/False?	5	2
11	If the area of cross section of a conductor is halved, then the resistance will	2	2
12	Ruby laser operates in pulsed mode. True/False?	3	2
13	Laser beam is highly directional, monochromatic and coherent. True/False?	3	1
14	The propagation of light in an optical fiber is based on a principle of total internal reflection. True/False?	4	2
15	In step index fiber, the refractive index of the core varies with distance from fiber axis. True/False?	4	2
16	Friction is a conservative force. True/False?	1	1
17	Electric field lines originate from negative charges and terminates on positive charges. True/False?	1	1
18	When the p-n junction is reverse biased, the width of the depletion region	5	2
19	The electrostatic force is always attractive. True/False?	2	2
20	The body in circular motion moves with uniform velocity. True/False?	1	1
21	In a solar cell, energy is converted intoenergy.	5	1
22	In a forward biased p-n junction, width of a depletion region	5	2
23	The energy bandgap in a silicon semiconductor iseV.	5	1
24	The wavelength of He-Ne laser is	3	1
25	In an extrinsic semiconductor, number of electrons is equal to number of holes. True/False?	5	1
26	Population inversion is not necessary to achieve laser action. True/False?	3	1
27	Numerical aperture is defined as the sine of	4	1
28	If q is the total charge enclosed by a surface S , then the electric flux through a closed surface S is	2	1
29	The potential energy in a compressed spring is less as compared to an unstretched spring. True/False?	1	2

30	Displacement is a scalar quantity. True/False?	1	1
31	Velocity of charge in velocity selector is	2	2
32	Work done on a body is a vector quantity. True/False?	1	2
33	Light year is the unit of length used to measure atomic sizes. True/False?	1	1
34	In a graded index fiber, the path of totally reflected light is.....	4	2
35	If a particle is moving with constant velocity, its average velocity and instantaneous velocity are same. True/False?	1	2

Section B

Attempt any FOUR Questions

(4 × 5 = 20)

Q.No.	Questions	CO	BL
1.	With the help of diagrams, explain the three radiative processes that may occur when light radiation interacts with matter.	3	2
2.	Find the expression for average kinetic energy of a simple harmonic motion.	1	4
3.	Write down the mathematical expression for Poynting vector. What does it physically signify. Explain.	2	2
4.	Explain the phenomenon of total internal reflection of light. How is it used in propagation of light in optical fiber?	4	2
5.	State and explain the Gauss's law in electrostatics.	2	2
	What is an LED? Explain its working.	5	2

Section C

Attempt any TWO Questions

(2 × 10 = 20)

Q.No.	Questions	CO	BL
1.	Write short notes on any two of the following: (i) Periodic and Oscillatory motion, (ii) Newton's laws of motion, (iii) Coulomb's law in electrostatics (iv) Ohm's law.	1,2	3,4
2.	Derive the expression for numerical aperture for an optical fiber. Calculate the numerical aperture of an optical fiber if the refractive index of core is 1.55 and that of cladding is 1.50.	4	3,4
3.	Explain the construction and working of a Ruby laser.	4	2
4.	Explain the operation of <i>p-n</i> junction under forward bias and reverse bias. Draw and explain the V-I characteristics of <i>p-n</i> junction.	5	2

BL: Bloom's Taxonomy Level (1-Remembering, 2-Understanding, 3-Appling, 4- Analysing, 5-Evaluating, 6- Creating).