

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
TEST 3 EXAMINATIONS - DECEMBER 2017  
B.Tech, 1<sup>st</sup> Semester (BT/BI)

COURSE CODE: 17B11PH111

MAX. MARKS: 35

COURSE NAME: Basic Engineering Physics

COURSE CREDITS: 04

MAX. TIME: 2.0 HRS

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

**Q.1.** Write short notes on:

[6x1=6]

- i. Two main reasons for change in behavior of nanomaterials
- ii. Quarter wave plate and half wave plate
- iii. Factors affecting the surface tension
- iv. Splitting and formation of drops
- v. Optical activity
- vi. Different methods of centrifugation

**Q.2.** Derive the allowed energy term for the particle in a box problem starting from the specific boundary conditions. [3]

**Q.3.** How to analyze circularly and elliptically polarized lights. Explain with the help of proper illustrations. [3]

**Q.4.** What is the molecular origin of the surface tension? [2]

**Q.5.** Discuss any one method to measure the surface tension of liquids in detail. [3]

**Q.6.** How the properties get changed in comparison to bulk counterparts in quantum dots and magnetic nanoparticles discuss with the help of diagrams. [3]

**Q.7.** What is the classification of nanomaterials explain with the help of proper examples. [2]

**Q.8.** Solve the following problems:

i. The refractive indices of glass and water are 1.54 and 1.33, respectively. For which case polarizing angle will be greater: for a beam incident from water to glass or for a beam incident from glass to water? [1.5]

ii. If the polarizing angle of a piece of glass for green light is  $60^\circ$ , calculate the angle of minimum deviation for a  $60^\circ$  prism made of same glass. [1.5]

- iii. Unpolarised light is incident on two polarizing sheets one on top of the other. What must be the angle between the characteristics directions of sheets if the intensity of transmitted light is
- (a)  $\frac{1}{4}$  of maximum intensity of the transmitted beam and
- (b)  $\frac{1}{4}$  of intensity of incident beam.

Assume that sheet reduces the intensity of unpolarised light by exactly 50%.

[1.5]

- iv. A sugar solution in a tube of length 20 cm produces optical rotation of  $13^\circ$ . The solution is then diluted to half of its previous concentration. Find the optical rotation produced by 40 cm long tube containing the diluted solution.

[1.5]

- v. A mercury drop of radius 0.75 cm falls from a height on a glass plate and breaks into a million of droplets, all of the same size. Find the height from which the drop must have fallen. Density of mercury =  $13600 \text{ kg/m}^3$  and surface tension of mercury is  $0.465 \text{ N/m}$ .

[3]

- vi. Eight droplets of water, each of radius 0.4 mm, coalesce into a single drop. Find the change in the total surface energy. Surface tension of water is  $0.072 \text{ N/m}$ .

[2]

- vi. The work done in increasing the size of soap film from  $10 \text{ cm} \times 6 \text{ cm}$  to  $10 \text{ cm} \times 10 \text{ cm}$  is  $3 \times 10^{-3} \text{ J}$ . What will be the surface tension of the film?

[1]

- vii. Pressures inside two soap bubbles are 1.01 and 1.02 atmospheres. What will be the ratio between their volumes?

[1]