

**B.Tech. DEGREE EXAMINATION, MAY 2016**

Second Semester

**15PY101 – PHYSICS**

*(For the candidates admitted during the academic year 2015 -2016)*

**Note:**

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45<sup>th</sup> minute.
- (ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

**PART – A (20 × 1 = 20 Marks)**

Answer ALL Questions

1. In torsion pendulum, when disc is rotated in horizontal plane so as to twist the wire, the various elements of wire undergoes \_\_\_\_\_  
(A) Tensile strain (B) Bulk strain  
(C) Shearing strain (D) Youngs modulus
2. The rate of applied load to original cross-sectional area is termed as \_\_\_\_\_  
(A) Nominal stress (B) Yield stress  
(C) Ultimate stress (D) Breaking stress
3. The prolongation of sound before it decay to negligible intensity is called \_\_\_\_\_  
(A) Absorption (B) Reverberation  
(C) Loudness (D) Resonance
4. In magnetostriction effect, the change in length of rod depends upon its nature and strength of \_\_\_\_\_  
(A) Force (B) Velocity  
(C) Electric field (D) Magnetic field
5. The flux of magnetic induction (B) across a closed surface is \_\_\_\_\_  
(A) Zero (B) Maximum  
(C) Minimum (D) Unit
6. The velocity of electromagnetic waves in any medium is \_\_\_\_\_  
(A)  $\sqrt{\mu\epsilon}$  (B)  $\sqrt{\mu_o\epsilon_o}$   
(C)  $\frac{1}{\sqrt{\mu\epsilon}}$  (D)  $\frac{1}{\sqrt{\mu_o\epsilon_o}}$
7. The dominant mode in rectangular waveguide is said to be the a \_\_\_\_\_ frequency that can propagate in a waveguide  
(A) Highest (B) Lowest  
(C) Normal (D) Medium

8. For a dominant mode of operation in cavity magnetron oscillator, the adjacent poles have a phase difference of \_\_\_\_\_ radians
- (A)  $\frac{\pi}{2}$  (B)  $\frac{\pi}{4}$   
(C)  $2\pi$  (D)  $\pi$
9. A pair of mirrors placed on either side of active medium is known as \_\_\_\_\_
- (A) Shielding (B) Cavity  
(C) Optical resonator (D) Case
10. \_\_\_\_\_ is a form of ultraviolet chemical laser which is commonly used in eye surgery and semiconducting manufacturing
- (A) CO<sub>2</sub> laser (B) Excimer laser  
(C) Free electron laser (D) Nd:YAG laser
11. Laser radiation elastically scattered from atom (or) molecules is observed with no change of frequency is \_\_\_\_\_ scattering
- (A) Rayleigh (B) Raman  
(C) Bose (D) Mie
12. In single mode optical fibers, the V number is less than
- (A) 1.0 (B) 0.25  
(C) 0.50 (D) 2.4
13. A variable quantity which characterizes de-Broglie waves is known as \_\_\_\_\_
- (A) Phonon (B) Boson  
(C) Wave function (D) Eigen function
14. \_\_\_\_\_ is the probability of finding the particles inside the box
- (A) Hybridization (B) Quantization  
(C) Interference (D) Normalization
15. The combination of 32 point groups with 14 Bravais lattice leads to \_\_\_\_\_ space groups
- (A) 235 (B) 230  
(C) 240 (D) 250
16. Error in charge distribution in solids are called \_\_\_\_\_ defects
- (A) Entropy (B) Enthalpy  
(C) Electronic (D) Charge
17. The photo voltaic cell converts solar radiation into \_\_\_\_\_
- (A) Electrical energy (B) Chemical energy  
(C) Mechanical energy (D) Sound energy
18. \_\_\_\_\_ are caused by uneven heating of the atmosphere by the sun, the irregularities of the earth's surface and rotation of the earth
- (A) Tides (B) Winds  
(C) Biodiesel (D) Alcohols

19. \_\_\_\_\_ are produced from renewable materials, such as plants  
 (A) Geothermal energy (B) Wind energy  
 (C) Solar energy (D) Bio fuels
20. A \_\_\_\_\_ is simply a structure in which water molecules under certain conditions bond to form an ice-cage that encapsulates a gas molecule  
 (A) Clathrate (B) Hydrogen  
 (C) Carbon dioxide (D) Oxygen

**PART – B ( $5 \times 4 = 20$  Marks)**

Answer ANY FIVE Questions

21. Derive the expression to find moment of inertia of an irregular body using time period oscillation in torsion pendulum.
22. Write a note on ductile fracture in material.
23. Define: Poynting Vector ( $\vec{P}$ ). Prove that energy of an electromagnetic wave is shared equally by electric and magnetic fields.
24. Discuss with theory the construction and working of homojunction semiconductor laser.
25. Discuss on remote sensing application of laser.
26. Write a note on Laue method for the study of crystal structure.
27. Write a short note on double-basin tidal conversion system.

**PART – C ( $5 \times 12 = 60$  Marks)**

Answer ALL Questions

28. a.i. Explain non-uniform bending with necessary theory to determine Young's modulus of the material. (8 Marks)
- ii. What is creep in metal? Explain three stages of creep. (4 Marks)
- (OR)**
- b.i. Discuss the following factors affecting Acoustics in building and their remedies  
 (i) Reverberation  
 (ii) Echoes and  
 (iii) Resonance (9 Marks)
- ii. A cast iron bed plate for a pump has the Young's modulus  $210 \text{ GN/m}^2$  and the fracture strength required is  $1.6 \times 10^8 \text{ N/m}^2$ . The specific surface energy is  $10 \text{ J/m}^2$ . Calculate the crack length of cast iron. (3 Marks)
29. a.i. Obtain the Maxwell's equations of electromagnetism using Gauss law of electrostatics and Amperes circuital law. (8 Marks)
- ii. Write a note on radar with neat diagram. (4 Marks)

**(OR)**

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- b.i. From the wave equation for an electromagnetic wave, deduce the expression for the characteristics impedance of a medium.
- ii. Write a note on circular waveguide along with its applications.
30. a.i. Describe the construction, working of CO<sub>2</sub> laser with neat diagram. (8 Marks)
- ii. Deduce the expression for the ratio of spontaneous emission rate to the stimulated emission rate. (4 Marks)

(OR)

- b.i. Explain the classification of optical fiber based on modes with diagram. (8 Marks)
- ii. Calculate the V-number and number of modes propagating through the fiber having  $a = 10 \mu\text{m}$ ,  $n_1 = 1.72$ ,  $n_2 = 1.69$  and  $\lambda = 1 \mu\text{m}$ . (4 Marks)
31. a.i. Derive Schrodinger time independent wave equation. (8 Marks)
- ii. What are Miller indices? Write the various steps involved in indexing a crystal plane. (4 Marks)

(OR)

- b. How are the atoms arranged in a hcp structure? Calculate the number of atoms, atomic radius, Coordination number and packing factor for hcp unit cell.
32. a. i. Explain the principle construction, and working of a solar cell with diagram. (8 Marks)
- ii. Write a note on
- (1) Hot dry rock resources and
  - (2) Magma resources. (4 Marks)

(OR)

- b.i. Describe the working of H<sub>2</sub>O<sub>2</sub> fuel cell with a neat diagram along with its advantages and disadvantages. (8 Marks)
- ii. Write a note on closed-cycle ocean thermal energy conversion (OTEC) system with neat diagram. (4 Marks)

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