



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Programme 6th Semester Examination, 2021



**ELSGDSE05T-ELECTRONICS (DSE2)**

**PHOTONIC DEVICES AND POWER ELECTRONICS**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.*

**SECTION-A**

**Answer any five from the following**

2×5 = 10

1. What is population inversion?
2. Name the materials used for the emission of blue and red light from LED. What is line shape function for laser?
3. Define sensitivity of a phototransistor.
4. What is "dark current" of a photodiode?
5. What do you mean by  $\frac{dv}{dt}$  triggering in a thyristor?
6. What are the basic difference between Power MOSFET and normal MOSFET?
7. Define holding current of SCR. What is the effect of negative gate current in a normal SCR?
8. Why is pulse triggering preferred for SCR and when does it fail?

**SECTION-B**

**Answer any six from the following**

5×6 = 30

9. Derive the expression for radiation density in terms of Einstein's coefficients. 5
- 10.(a) What are different modes in an optical fiber? Explain them. 2+3

- (b) A graded index fiber has a core with a parabolic refractive index profile which has a diameter of 50  $\mu\text{m}$ . The fiber has a numerical aperture (NA) of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1  $\mu\text{m}$ .
- 11.(a) What is Electroluminescence? 2+2+1  
 (b) Why the injection LASER is more advantageous over LED?  
 (c) Draw a graphical result between light output and current. Indicate the threshold current on this graph.
12. Describe the operation of LED with proper diagram. Compare LED and LCD.  $2\frac{1}{2}+2\frac{1}{2}$
13. Enumerate the basic differences between a triac and thyristor. Draw and explain a full-wave triac phase control circuit. 2+3
14. Differentiate between photodiode and phototransistor. 5
- 15.(a) What is the role of capacitor in commutation circuit? 2+2+1  
 (b) What is the difference between natural and forced commutation?  
 (c) What is three phase controlled rectifier?
16. Describe with suitable diagrams, the principle of operation of heterojunction laser. 5
17. How the SCR can be used as a Rectifier? What is the basic difference between an SCR based rectifier and Diode rectifier? 3+2
18. Draw the static V-I characteristics of SCR and explain its modes of operation. 5

**N.B. :** Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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