

**B.Sc. (Semester VI) Examination, April/May 2019**  
**PHYSICS (Paper – I) (Solid State Devices and Instrumentation)**

Duration : 2 Hours

Max. Marks : 80

- Instructions :**
- i) All questions are **compulsory**. However, internal choice is available.
  - ii) Figures to the **right** indicate marks.
  - iii) Symbols have their usual meaning unless otherwise stated.
  - iv) Draw **neat** diagrams **wherever** necessary.
  - v) **Use of non-programmable calculator is permitted.**

1. Answer **any four** of the following : **(4×4=16)**
- a) Why Schottky barrier diode is called hot carrier diode ? How is it different from that of a PN junction diode ?
  - b) What is a Shockley diode ? Give its basic structure, equivalent transistor circuit, schematic symbol and its breakdown characteristics.
  - c) Explain briefly the manner in which the storing and transfer of charges occurs in a charge coupled device.
  - d) Draw the circuit diagram of a multi range ammeter using PMMC and Aryton Shunt. What is the advantage of Aryton shunt ?
  - e) What are the functions of horizontal and vertical deflecting plate system in a Cathode Ray Oscilloscope ?
  - f) Distinguish between transducers and sensors. Give one example for each.
2. Answer **any four** of the following : **(4×4=16)**
- a) Give the symbol, equivalent circuit, I-V characteristics and state any one application of a tunnel diode.
  - b) For a unijunction transistor with  $V_{BB} = 10 \text{ V}$ ,  $\eta = 0.65$ ,  $R_{B1} = 2 \text{ K}$  (at  $I_E = 0$ ) and  $V_D = 0.7 \text{ V}$ , determine  $V_P$ ,  $R_{BB}$ ,  $R_{B2}$  and voltage across  $R_{B1}$ .
  - c) What is the basic principle involved in PMMC instrument ? What are the precautions to be taken while using a multi range analog measuring instrument ?
  - d) Design a two range Aryton Shunt ammeter to measure 10 mA and 100 mA using a de Arsonval meter movement of  $R_m = 100 \Omega$  and  $I_{fsd} = 1 \text{ mA}$ .





e) Explain piezoelectric effect with an illustrative diagram. Give any one application of piezoelectric effect in transducers.

f) What are Thermistors ? Give typical Voltage-Current and Resistance-Temperature characteristics of a NTC thermistor.

3. A) Draw the two transistor model of an SCR and explain its 'turn on' and 'turn off' mechanism. Explain the use of SCR as a variable half wave rectifier.

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OR

A) Draw the circuit diagram of a Diac-Triac phase control circuit and explain its working.

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B) What is photovoltaic effect ? Discuss construction, V-I characteristics, working principle and application of solar cell.

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4. A) What is Silicon Controlled Switch (SCS) ? Give its equivalent transistor circuit and schematic symbol. Explain how the device can be turned on and turned off.

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OR

A) Discuss the concept of loading effect with reference to measurement of voltages using an analog voltmeter, with an illustrative example.

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B) Explain with a suitable diagram, the working principle of Plumbicon tube.

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5. A) Explain the construction and design of a series type ohm-meter using a de Arsonval meter movement.

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OR

A) Explain the principle involved in Q meters and one of its applications.

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B) Explain why delay line is used in Cathode Ray Oscilloscope (CRO) with a suitable block diagram.

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6. A) Explain the principle of operation of resistance wire strain gauges. Derive an expression for gauge factor of a strain gauge in terms of Poisson's ratio.

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OR

A) Explain Hall Effect. Discuss Hall Effect transducer in detail.

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B) Draw a block diagram of a standard AF sine-square wave generator and explain the function of each block.

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