2021

ELECTRONICS— GENERAL

Paper : DSE-A-2

(Photonic Devices and Power Electronics)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***Question No. 1*** and ***any four*** questions from the rest.

1. Answer ***any ten*** questions: 1×10

I. Resistive transducers are _____.

(a) Primary transducers (b) Secondary transducers

(c) Either primary or secondary (d) None of these.

II. What will happen to resistivity of metal and semiconductor, if the temperature is increased?

(a) Increases

(b) Decreases

(c) For metal increases and for semiconductor decreases

(d) For metal decreases and for semiconductor increases.

III. Which of the following waveforms are generated by Wien-bridge oscillators?

(a) Square wave (b) Sine wave

(c) Triangular wave (d) Pulse wave.

IV. In RC phase shift oscillator, one R-C bridge provides _____ phase shift.

(a) 30° (b) 60°

(c) 90° (d) 180°.

V. Which of the following oscillators have higher stability at a higher frequency?

(a) Wien-bridge oscillator (b) RC phase shift oscillator

(c) Crystal oscillator (d) All of these.

VI. Bridge circuit is used for the measurement of which of the following components?

(a) Resistance, capacitance and inductance (b) Diode, triode and thyristor

(c) Transistor, thermistor and antenna (d) LED, op-amp and transducer.

VII. LASER source is always _____.

(a) Coherent (b) Incoherent

(c) Bidirectional (d) All of these.

VIII. Vibration galvanometers are used for _____.

(a) very high frequency (b) very low frequency

(c) low audio frequency (d) high audio frequency.

IX. CRO is used for measurement of _____.

(a) AC as well as DC signals (b) AC signals only

(c) DC signals only (d) AC power only.

X. Fiber optic cable operate at frequency near _____.

(a) 2 GHz (b) 20 MHz

(c) 200 MHz (d) 800 THz.

XI. In a DVM, a signal conditioning circuit is used

(a) to bring current to a suitable limit. (b) to bring resistance to a suitable limit.

(c) to bring capacitance to a suitable limit. (d) to bring voltage to a suitable limit.

XII. _____ is a type of photo detector which can convert optical signals into electrical signal.

(a) Avalanche diode (b) PIN diode

(c) Zenar diode (d) Schottky diode.

2. (a) Explain direct and indirect band gap semiconductors with band diagram.

(b) Which one of the above is required for optoelectronic application and why?

(c) Explain the operation of any one heterostructure devices. 4+2+4

3. (a) Explain the operation of population inversion in LASER.

(b) What is spontaneous emission?

(c) What is the condition for amplification in LASER? 4+2+4

4. (a) How LED can be constructed?

(b) Explain the structure of Liquid Crystal Displays.

(c) Compare LCD and CRT display. 4+4+2

5. (a) Explain the term ‘numerical aperture’ of an optical fiber.

(b) Describe briefly Single Mode Fibers and Graded Index Fiber structure with diagram.

(c) What is the problem of multimode step index fiber? 3+5+2

6. (a) Explain the operation and I-V characteristics of SCR with necessary diagram.

(b) Explain the On and Turn-Off characteristics of SCR.

(c) Why SCR is called controlled rectifier? 4+4+2

7. (a) Why we require Semiconductor Power Devices?

(b) Explain the operation of Power MOSFET.

(c) Draw the basic structure of a DIAC and explain its I-V characteristics. 2+4+4

8. (a) Draw the basic structure of IGBT and explain its working principle.

(b) What is requirement of Commutating Circuits?

(c) Write a short note on DC Link Invertors. 4+2+4

———————