PG Odd Semester (CBCS) Exam., December—2018

PHYSICS

(1st Semester)

Course No. : PHYCC–104

(Electronics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* What is transistor biasing? Name the methods of biasing. 2+2=4

(b) Describe the voltage divider method of transistor biasing. How is the stability of operating point achieved in the method? 7+3=10

2. *(a)* Discuss the formation of depletion layer in a *p-n* junction. 3

(b) Derive the diode equation. 7

(c) Current flowing across a *p-n* junction at room temperature under reverse bias is 0·15 A. Determine the forward bias current through the diode when applied voltage is 0·12 V. Given V_T 25 mV and 1. 4

UNIT—II

3. Draw the circuit diagram of a Hartley oscillator and explain its operation. Also determine the frequency of oscillation and condition for sustained oscillations for it. 4+5+5=14

4. *(a)* Describe the basic structure and operation of *p-n* junction laser. How does it differ from LED? 5+5+2=12

(b) What are photodetectors? 2

UNIT—III

5. *(a)* Derive the expressions for output of OPAMP used as—

(i) log and anti-log amplifier;

(ii) instrumentation amplifier. 6+4=10

(b) Discuss the concept of 'virtual ground' in an inverting OPAMP. 4

6. *(a)* Define the following d.c. error voltages and currents of an OPAMP : 2×4=8

(i) Input bias current

(ii) Input offset voltage

(iii) Input offset current

(iv) Output offset voltage

(b) Consider a differential amplifier with inputs :

(i) V_1 50 V and V_2 50 V

(ii) V_1 1050 V and V_2 950 V

If the CMRR = 100, calculate the percentage difference in the output for two sets of inputs. 4

(c) What is the basic function of voltage comparator? How can the speed of operation of a comparator be improved? 1+1=2

UNIT—IV

7. *(a)* Express the Boolean expression Y $(A$ $BC)(B$ $\overline{C}A)$ as a product of sum (in standard form). 6

(b) Describe the working of *(i)* multiplexer and *(ii)* de-multiplexer with appropriate logic circuits. 4+4=8

8. *(a)* Prove the following Boolean equations : 2+2=4

(i) $\overline{AB}$ $\overline{A}$ AB 1

(ii) A $\overline{A}B$ A B

(b) Draw the logic circuit of a 4-bit ripple counter and describe its working. What is 'ripple delay'? 2+3+3+2=10

UNIT—V

9. *(a)* What is DSBSC modulation? Show that output of a balanced modulator is an amplitude modulated signal with two side bands but carrier frequency suppressed. 2+5=7

(b) Define acceptance angle and numerical apperture of an optical fibre. How are they related to refractive indices of the core and cladding? 3+4=7

10. *(a)* Define frequency modulation (FM). Derive the expression for an FM wave. Discuss the advantages of FM over AM. 2+5+3=10

(b) What is noise? Discuss various sources of noise in a transistor. 1+3=4

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