NEW

3-Tier

2015

ELECTRONICS

(General)

PAPER—III

(PRACTICAL)

Full Marks : 100

Time : 3 Hours

The figures in the margin indicate full Marks.

Group—A

(Semiconductor Devices and Circuits)

Answer any *one* question.

1. Construct a circuit to study the current-voltage $(I - V)$ characteristics curve of a forward biased p-n junction diode. Determine the cut-in-voltage. Calculate the dynamic resistance and compare with theoretical values. (Assume $\frac{kT}{q} = 0.026\,V$.)

   (Th–5, Ckt–5, Data–8, Graph–6, Calculation–2+2+2, Discussion–5.)

2. Study the reverse characteristics of a Zener diode. Specify the Zener region. Find Zener break-down voltage. Calculate dynamic resistance.

   (Th–5, Ckt–5, Data–10, Graph–5, Calculation–2+2+2, Discussion–4.)

(Turn Over)

3. Study the load regulation curves of a Zener diode considering (a) $V_S = 1 \cdot 25 \ V_Z$ and (b) $V_S = 1 \cdot 5 \ V_Z$ where V_S = supply voltage, V_Z = Zener break-down voltage. Calculate the percentage regulation in each case.

(Th–5, Ckt–5, Data–8, Graph–5, Calculation–4+4, Discussion–4.)

4. Study line regulation of a Zener diode. Consider two different values of load current. Calculate regulation factor in each case.

(Th–5, Ckt–5, Data–12, Graph–6, Calculation–4, Discussion–3.)

5. Construct a full-wave rectifier with a centre-tapped transformer and a $\prod$ filter. Plot $I_L - V_L$ graph for at least two different input voltages. Calculate percentage regulation of the rectifier.

(Th–5, Ckt–5, Data–12, Graph–6, Calculation–4, Discussion–3.)

6. Construct the bridge rectifier with a π filter. Plot $I_L - V_L$ graph for two input voltages. Calculate percentage regulation in both cases.

(Th–5, Ckt–5, Data–12, Graph–6, Calculation–5, Discussion–2.)

7. Draw the output characteristic curve of a given n-p-n transistor in CE mode for three different values of base current.

(Th–5, Ckt–5, Data–12, Graph–5, Calculation–4, Discussion–4.)

8. Draw the input characteristic curves of the given n-p-n transistor in CE mode for two values of V_{CE}. Calculate h_{ie} in each case.

(Th–5, Ckt–5, Data–12, Graph–6, Calculation–4, Discussion–3.)

Group—B

(Instrumentation and Digital Electronics)

Answer any *one* question.

9. Construct an astable-multivibrator with 555 timer for a suitable given frequency. Study the waveform on a CRO and measure its duty cycle.

(Th–10, Ckt–10, Data + Calculation of duty cycle–10, Discussion–5.)

10. Measure the output offset voltage of an IC-741 OPAMP for different feedback resistance. Implement the circuit on a bread board and show the results.

(Th–8, Ckt–5, Data–14, Calculation–6, Discussion–2.)

11. Construct an adder amplifier with IC-741 and measure the output voltage for at least five input voltages. Measure output voltage V_S in terms of differential input voltages $(V_+ - V_-)$.

(Th–10, Ckt–5, Data–10, Graph–5, Calculation–3, Discussion–2.)

12. Construct an integrator circuit with IC-741. Measure output voltages for at least five input voltages. Plot output voltage *vs.* input voltage curve.

(Th–8, Ckt–5, Data–10, Graph–5, Calculation–3, Comparison of output voltage with theoretical value–2, Discussion–2.)

13. Construct a half-adder circuit with minimum number of gates and verify its operation.

(Th–8, Ckt–6, Ckt implementation–6, Data–10, Discussion–5.)

14. For the logic expression :

$$Y = \bar{A}B + \bar{B}A$$

Realise the operation using minimum number of NAND gates only.

Obtain the truth table.

Name the operation performed.

(Th+Ckt–12, Implementation–8, Data–12, Discussion–3.)

15. Construct a J–K flip-flop with minimum number of gates and verify its operation.

(Th+Ckt–12, Implementation–10, Data–10, Discussion–3.)

16. Design a circuit using available gates to realise the function :

$$Y = (A + BC)(B + C\bar{A})$$

Obtain its truth table and specify the number of gates required.

(Th+Ckt–12, Implementation–8, Data–12, Discussion–3.)

Marks Distribution

Group A Experiment	:	35
Group B Experiment	:	35
Viva–Voce (10+10)	:	20
Laboratory Note Book (5+5)	:	10
	Total :	100