

2 0 1 4

(3rd Semester)

ELECTRONICS

THIRD PAPER

(Electronic Devices and Amplifiers)

(PART : A—OBJECTIVE)

(Marks : 20)

The figures in the margin indicate full marks for the questions

SECTION—I

(Marks : 5)

Answer **all** questions

Each question carries 1 mark

Put a Tick (✓) mark against the correct answer in the brackets provided :

1. The gate of the JFET is — biased.

(a) reverse ()

(b) forward ()

(c) reverse and forward ()

(d) zero ()

2. Inter-base resistance of a UJT varies from

(a) 4–12 k Ω ()

(b) 6–10 k Ω ()

(c) 2–5 k Ω ()

(d) 4–10 k Ω ()

3. The property due to which LCD is used for display device is

(a) it requires little power ()

(b) liquid crystal has a strong directional property ()

(c) it can withstand high temperature ()

(d) liquid crystal transmits light easily ()

4. The voltage gain of a tuned amplifier is — at resonant frequency.

(a) minimum ()

(b) maximum ()

(c) half-way between maximum and minimum ()

(d) zero ()

5. Current cannot flow to ground through

(a) a mechanical ground ()

(b) an a.c. ground ()

(c) a virtual ground ()

(d) an ordinary ground ()

(4)

SECTION—II

(Marks : 15)

Answer *any* **five** questions

Each question carries 3 marks

1. What are the advantages of inserting I-layer in a P-N diode?

(5)

2. Explain the frequency response of an OP-AMP.

(6)

3. How will you transform a sine wave into a square wave using Zener diode?

4. The following readings were obtained experimentally from a JFET :

V_{GS}	0 V	0 V	-0.2 V
V_{DS}	7 V	15 V	15 V
I_D	10 mA	10.25 mA	9.65 mA

Determine (a) a.c. drain resistance, (b) transconductance and (c) amplification factor.

5. With a suitable diagram, explain the working of a half-wave rectifier using p - n junction diode.

6. Write the relation between quality factor and bandwidth of a tuned amplifier. The Q of a tuned amplifier is 60. If the resonant frequency for the amplifier is 1200 kHz, find (a) bandwidth and (b) cut-off frequency.

(10)

7. Explain with the diagram, $V-I$ characteristics of an SCR.

8. Define input bias current of OP-AMP. A certain OP-AMP has bias currents of $50\ \mu\text{A}$ and $49.3\ \mu\text{A}$. Find the input bias current.

(4)

III/ELEC (iii)

- (b) A differential amplifier has an output of 1 V with a differential input of 10 mV and an output of 5 mV with a common-mode input of 10 mV. Find the CMRR in dB.

2

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Full Marks : 55

Time : 2 hours

(PART : B—DESCRIPTIVE)

(Marks : 35)

*The figures in the margin indicate full marks
for the questions*

1. (a) Write two advantages and disadvantages of JFET. Explain in brief the output characteristics of JFET. 2+2=4
- (b) Compare MOSFET with JFET in terms of their characteristics. 3

Or

- (a) Write short notes on the following : 3
- (i) Shorted-gate drain current (I_{DSS})
- (ii) Pinch off voltage (V_P)
- (iii) Gate-source cut-off voltage ($V_{GS(off)}$)

(2)

- (b) With suitable diagram, discuss the construction and working of enhancement-type MOSFET. $2+2=4$

2. (a) Explain with the diagram, $V-I$ characteristics of $p-n$ junction diode in forward and reverse bias. 3

- (b) Write the construction and operation of UJT when emitter open and positive voltage applied to the emitter. $2+2=4$

Or

- (a) Explain the UJT used as relaxation oscillator. 3

- (b) Explain firing and triggering of an SCR. Also explain 90° phase control of an SCR. $2+2=4$

3. (a) With a suitable diagram, explain the construction and working of a solar cell. $3+2=5$

- (b) Discuss the characteristics of a $P-N$ junction photodiode. 2

Or

- (a) Write down the theory and construction of LED. $3+2=5$

- (b) What is the function of a transistor in a transistor series regulator? 2

(3)

4. (a) Draw the power diagram of transformer coupled class-A amplifier and locate the Q-point. Show that the efficiency of transformer coupled class-A amplifier is 50% in an ideal case. $1+4=5$

- (b) Write the difference between tuned amplifiers and other amplifiers. 2

Or

- (a) In a transformer-coupled class-A amplifier $V_{CE(max)} = 27\text{ V}$ and $V_{CE(min)} = 3\text{ V}$, compute its overall efficiency. 2

- (b) Find out the expression for impedance and frequency in the parallel resonant circuit used in a tuned amplifier. $2+3=5$

5. (a) What are differential amplifiers? Draw the basic circuit of differential amplifier. $1+1=2$

- (b) With a circuit diagram, explain the operation of a single-ended differential amplifier. 5

Or

- (a) Derive an expression for gain in an inverting OP-AMP. Explain the input impedance and output impedance of inverting amplifier. $3+2=5$