2017

(CBCS)

(3rd Semester)

ELECTRONICS

Paper : EL – 301

(Electronic Devices and Amplifier)

Full Marks : 75

Time : 3 hours

(PART : A - OBJECTIVE)
(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION – A
(*Marks* :10)

Put a Tick (✓) mark against the correct answer in the brackets provided for it : 1×10=10

1. A JFET is ..... driven device.
   (a) an electron ( ) (b) a current ( )
   (c) a voltage ( ) (d) both current and voltage ( )

2. A MOSFET has ..... terminals.
   (a) two ( ) (b) three ( )
   (c) four ( ) (d) five ( )

3. The small leakage current in a diode during reverse bias is due to
   (a) minority carrier ( ) (b) majority carrier ( )
   (c) large applied voltage ( ) (d) barrier potential ( )

4. An SCR behaves as
   (a) thermal switch ( ) (b) bidirectional switch ( )
   (c) mechanical switch ( ) (d) unidirectional switch ( )

5. The frequency response of transformer coupling is
   (a) good ( ) (b) very good ( )
   (c) excellent ( ) (d) poor ( )

6. The maximum efficiency of a class B push-pull amplifier is
   (a) 100% ( ) (b) 78.5% ( )
   (c) 50% ( ) (d) 85% ( )

7. The phase of the output signal is of ..... with the input signal for R-C coupled amplifier.
   (a) 0° ( ) (b) 90° ( )
   (c) 180° ( ) (d) 360° ( )

8. The dimension of h_{ie} parameter is
   (a) mho ( ) (b) ohm ( )
   (c) farad ( ) (d) henry ( )

9. The feedback component in an integrator is made of
   (a) resistor ( ) (b) inductor ( )
   (c) capacitor ( ) (d) combination of resistor and capacitor ( )

10. The common-mode rejection ratio of an ideal differential amplifier is
    (a) zero ( ) (b) infinity ( )
    (c) less than unity ( ) (d) greater than unity ( )

SECTION – B

(*Marks* : 15)

Answer the following questions: 3×5=15

1. What are the differences between JFET and bipolar transistor?

Or

A JFET has a drain current of 5 mA. If I_{DSS} = 10 mA and $V_{GS\ (off)}$ = - 6 V, find the values of (a) V_{GS} and *(b)* V_P.

2. What do you mean by forward biasing and reverse biasing of a *p-n* junction diode?

Or

Define 90° phase control in SCR.

3. Write the importance of blocking capacitor in class A power amplifier.

Or

For a class B amplifier, using a supply of V_{CC} = 12 V and driving a load of 10 Ω, determine the *(a)* maximum load power, *(b)* d.c. input power and *(c)* collector efficiency.

4. How will you achieve impedance matching in a transformer coupling?

Or

Write a short note on multistage amplifier.

5. Derive the expression for gain in a non-inverting OP-AMP.

Or

Draw a block diagram of typical OP-AMP and explain the function of each block.

(PART: B – DESCRIPTIVE)
(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Explain the construction and working of a JFET. 2+3=5

   (b) Define JFET parameters and establish the relationship between them. 3+2=5

Or

2. *(a)* Give the constructional details of enhancement type of MOSFET and show its output characteristics. 4+1=5

   (b) Compare various properties of JFET and MOSFET. 3

   (c) Write down any two applications of FET. 2

3. *(a)* What do you mean by energy level and energy band of an electron? 1+1=2

   (b) Classify solid in terms of energy band. 4

   (c) With necessary diagram, explain the *V-I* characteristics of *p-n* junction diode. 4

Or

4. *(a)* Describe the construction of UJT and derive the value of intrinsic stand-off ratio from its equivalent circuit diagram. 3+2-5

   (b) Explain the two-transistor analogy of SCR. 5

5. *(a)* Draw the power diagram of transformer coupled class A power amplifier and locate the Q-point. Show the efficiency of transformer-coupled class A amplifier is 50% in an ideal case. 2+3=5

   (b) Mention the special characteristics that distinguish a tuned amplifier from other amplifiers. State their advantages and disadvantages. 2+3=5

Or

6. *(a)* Explain the difference between a voltage amplifier and a power amplifier. 2

   (b) Briefly discuss the performance quantities of power amplifiers. 3

   (c) A class A transformer-coupled power amplifier has zero signal collector current of 50 mA. If the collector supply voltage is 5 V, find *(i)* the maximum a.c. power output, *(ii)* the power rating of transistor and *(iii)* the maximum collector efficiency. 5

7. *(a)* What do you understand by hybrid parameters? What are their dimensions? 1+2=3

   (b) With a neat circuit diagram, explain the working of transformer-coupled transistor amplifier. 7

Or

8. *(a)* Show the relation $R'_L = n^2 R_L$, where the symbols have their usual meanings in a transformer. 3

   (b) With a neat labeled diagram, explain the working of R-C coupled transistor amplifier. 7

9. *(a)* What are the characteristics of an ideal operational amplifier? 3

   (b) Find an expression for the overall gain in an OP-AMP in the case of inverting configuration 4

   (c) Write down the applications of OP-AMP. 3

Or

10. *(a)* Write the equation for common-mode rejection ratio (CMRR) and also mention some importances of CMRR. 1+2=3

    (b) What is the main function of a differential amplifier? With a circuit diagram, explain the operation of a single-ended differential amplifier. 1+4=5

    (c) What are virtual ground and summing point of an OP-AMP? 1+1=2

★★★