(Set-V_1)

B. Tech - 2nd(All Br.)
Basic Electronics

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1 which is compulsory

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×10

   (*a*) Realize an EX-OR gate with four NAND gates.

   (*b*) Perform $(17)_{10} - (11)_{10}$ in binary and also $(11)_{10} - (17)_{10}$ in binary.

   (*c*) What is PIV of a diode ?

   (*d*) What is bandwidth of an amplifier ?

   (*e*) Mention the relationship between α and β of a transistor ?

(*f*) What is ripple factor ? Mention its value for Full-Wave rectifier.

(*g*) Define the concept of slew rate and CMRR of an idea OPAMP.

(*h*) What is load line ? Explain its significance.

(*i*) Write two advantages of a push-pull power amplifier.

(*j*) What are the minimum values of gain in inverting and non-inverting amplifiers ?

2. (*a*) Explain about diode clipper and clamper circuits. 5

(*b*) Describe diode half-wave and full-wave rectifier circuits. 5

3. (*a*) Contruct a JK Flip-Flop using AND and NOR gates. 5

(*b*) Describe various logic gates with their truth table. 5

4. (*a*) Compare and contrast between AM and FM in a communication system. 5

(*b*) Explain how can you use to measure voltage, current, frequency, time period and phase difference of a sinusoidal wave in a CRO. 5

5. (*a*) Explain the various parameters of an OP-AMP. How these can be measured in laboratory. 5

(*b*) Discuss the importance of Intrinsic and Extrinsic semiconductor. 5

6. (*a*) Mention various properties of negative feedback. Draw the block diagrams of different feedback topologies. 5

(*b*) Explain the operation of crystal oscillator with the help of neat sketch. 5

7. (*a*) Establish the application of a BJT as an Amplifier and as a Switch. 5

(*b*) Prove that for CE transistor in active region, collector current is given by,

$$I_C = \beta^1 B + (1+\beta) I_{CO}$$ 5

8. Write short notes on any *two* : 5×2

(*i*) Class A Power amplifier

(*ii*) Thermal runway of transistors

(*iii*) JFET as a constant current source

(*iv*) Integrator and differentiator using Op-Amp.

If attempted → proper fashion marking
If not → No mark

B.Tech-I
BEL

BASIC ELECTRONICS

Full Marks-70
Time-3Hours

Answer SIX questions including Q.No.1 which is compulsory
Figures in the right-hand margin indicate marks

1. 2x10
   a. Explain how zener diode is used as voltage redulator.
   b. Explain the fuction of negative clipper ciruit.
   c. Explain how transistor acts as a switch.
   d. Draw non-inverting amplifier? Derive expression for its gain.
   e. Convert (10001.0010) to octal
   f. Explain 1's complement subtraction with an example.
   g. Draw block diagram of CRO.
   h. List the advantage of modulation.
   i. Differentiate between the amplitude modulation and frequency modulation.
   j. Convert JK fliplop to SR flipflop.

2. a) Explain the characteristics of Photo diode.
   b)Explain the operation of LED and Zener diode with neat diagrams. 5+5

3. a)Explain how MOSFET works with neat diagram.
   b)Determine the value of Rs and its transconductance gm required to self-bias an n-channel JFET with IDSS = 25mA, VGS(off) = -10V, VGS = -5V. 5+5

4. a)Draw half-wave rectifier circuit and derive expression for ripple factor.
   b) A full-wave bridge rectifier circuit with a 1kohm load operates from a 120V (rms) 60Hz household supply through 10-to-1 step-down transformer having a single secondary winding. It uses four diodes, each of which can be modeled to have a 0.7V drop for any current. What is the peak value of the rectified voltage across the load? For what fraction of the cycle does each diode conduct (assume ideal diode model for this estimation)? What is the average current through the load? 5+5

5. a) Illustrate the effect of negative feedback on amplifier.
   b) Prove that the gain of the amplifier used in a wein-bridge oscillator must be greater than 3 for sustained oscillations. 5+5

6. a)Subtract 26 from 75 using 2's complement method.
   b)Prove that AB+BC+A'C =AB + A'C. 5+5

7. a)Explain the operation of SR flipflop.
   b) Realize the following expression using universal gates.
   A'B+CD'E+B'CD. 5+5

8. a)Explain the operation of CRT.
   b) List the applications of CRO. 5+5