

**EEE- DEC 2010- 1****BT-1/DX: 8022****EL-101-E: Elements of Electronics Engineering**

Time : Three Hours

Maximum Marks : 75

**Note:-** Attempt any FOUR questions, with at least ONE from each section A, B, C and D. Section E is compulsory.

**SECTION-A**

- Q.1. a) Explain the mechanisms of breakdown in p-n diodes. Describe the use of Zener diode as a voltage regulator. 7.5
- b) A specimen of intrinsic Germanium at 300 °K, having a concentration of carriers of  $2.5 \times 10^{13} \text{ cm}^{-3}$  is doped with impurity atoms of one for every million germanium atoms. Assuming that all the impurity atoms are ionized and that the concentration of Ge atoms is  $4.4 \times 10^{22} \text{ cm}^{-3}$ , find the resistivity of doped material.

( $\mu_n$  for Ge is  $3600 \text{ cm}^2/\text{volt-sec}$ ). 7.5

- Q.2. a) Draw the circuit of a Full wave and bridge rectifier and centre tap transformer rectifiers, with the help of waveforms explain their operation.

Also discuss their diodes PIV values. 7.5

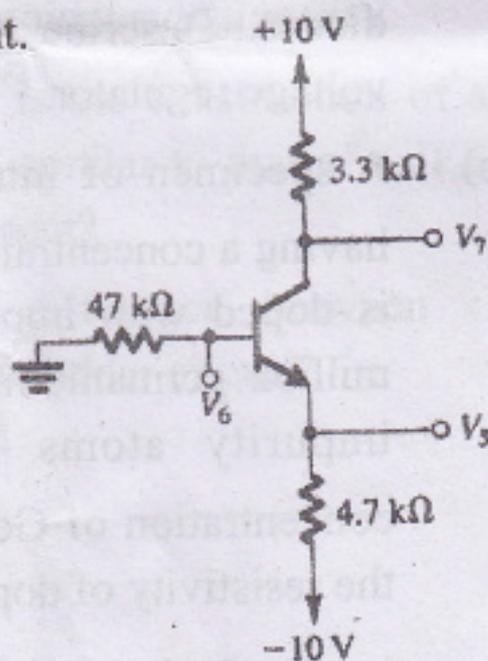
- b) What value of series resistance is required when 10W, 10V, 1000mA zener diodes are connected in series to obtain 20 V regulated output from a 35 V dc source? 7.5

## SECTION-B

- Q.3. a) Define  $\alpha$  of a transistor. Show that it is always less than unity. 7.5

Show that 
$$\beta = \frac{\alpha}{1-\alpha}$$

- b) The transistor in the circuit of figure 1 has  $\beta = 80$  exhibits a  $V_{BE}$  of 0.7V. Find all the terminal voltage and current. 7.5



- Q.4. a) Explain the working of a transistor as a switch. 5
- b) Draw the various basing circuits and explain their operations. Calculate the stability factor in each case. Why emitter divider bias is better than the two other techniques. 7.5

## SECTION-C

- Q.5. a) An amplifier with open loop voltage gain  $A_v = 1000 \pm 100$  is available. It is necessary to have an amplifier whose voltage gain varies by no more than 0.1%. Find the reverse transmission factor  $\beta$  of the feedback network used. 7.5
- b) Discuss IC741 with its complete pin diagram. 7.5
- Q.6. a) Draw the circuit of OPAMP as following and derive its output in case of its use as
- Scale changer
  - Differentiator
  - Draw the inverting and non-inverting amplifier circuits of an Opamp in closed loop configurations. Obtain an expression for closed loop gain in these circuits.

## SECTION-D

- Q.7. a) Prove that the transconductance  $g_m$  of a JFET is given by

$$g_m = \frac{2}{|V_P|} \sqrt{I_{DS} I_{DSS}}$$

Where  $V_P$  = Pinch off voltage,  $I_{DS}$  = Drain current  
 $I_{DSS}$  = Maximum value of  $I_{DS}$  corresponding to  
 $V_{GS} = 0$  volts. 7.5

- b) Discuss how JFET acts as a voltage amplifier. Draw the waveforms. 10

- Q.8. a) Explain the working relaxation oscillator using UJT. 5
- b) Explain the working of a digital CRO with the help of a block diagram. 10

### SECTION-E

6. Draw Energy band diagram of p-n junction at equilibrium, forward bias condition and reverse bias condition. 3
7. How can you check the polarity of the diode, if the mark on its body is rubbed off or not visible? 3
8. Sketch a circuit that will clip all levels of a sinusoidal signal above-5V. The peak to peak voltage of sinusoidal signal is 20V 3
9. IN what ways is the construction of a depletion-type MOSFET similar to that of a JFET? In what ways is it different? 3
10. What is the difference between a summing amplifier and an adder circuit? 3