

B.E. Instrumentation Engineering (MODEL CURRICULUM) Sem-III  
**IN303M : Electronics Devices & Circuits**

P. Pages : 2

Time : Three Hours



**GUG/W/22/14011**

Max. Marks : 80

- Notes :
1. Same Answer book must be used for each section.
  2. All questions carry marks as indicated.
  3. Due credit will be given to neatness and adequate dimensions.
  4. Diagrams and Chemical equation should be given wherever necessary.
  5. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Draw and explain the V-I characteristics of P-N junction diode. 8
- b) An a.c. supply of 230V is applied to a half wave rectifier circuit through a transformer of turn ratio 20:1. If the load resistance is  $1\text{ K}\Omega$  Find. 8
- i) The d.c. output voltage.
  - ii) Maximum value of output voltage.
  - iii) D.C. load current
  - iv) Maximum value of load current.

**OR**

2. a) For a full wave rectifier with center tapped transformer, find the average, RMS and peak values of current through the diode, If the voltage across half of the secondary is  $15\sin 314t$ . Also calculate the PIV of the diode. Given  $R_L = 1\text{ K}\Omega$  and assume diode is ideal. 8
- b) Differentiate between Clippers and Clampers. 8
3. a) Give the circuit arrangement and graph of obtaining the input and output characteristics of transistor in common emitter configuration. 8
- b) A Si NPN transistor having  $\beta = 100$  and  $I_{CO} = 22\text{ }\mu\text{A}$  is operated in a CE configuration. Assuming  $V_{BE} = 0.7\text{ V}$ , Determine the transistor currents and the region of operation of the transistor. What happens if the resistance  $R_C$  is indefinitely increased? 8

**OR**

4. a) Discuss the thermal runaway, how it can be prevented in a high power transistor? 8
- b) A transistor has  $I_B = 105\text{ }\mu\text{A}$  and  $I_C = 2.05\text{ mA}$ . Find: 8
- i)  $\beta$  of the transistor
  - ii)  $\alpha$  of the transistor
  - iii) Emitter current  $I_E$
  - iv) Now, if  $I_B$  changes by  $+27\text{ }\mu\text{A}$  and  $I_C$  changes by  $+0.65\text{ mA}$ . Find the new value of  $\beta$ .

5. a) Describe the electrical behavior of JFET using JFET parameter. 8
- b) A 2N 5486 JFET has values of  $V_{GS}(\text{off}) = -2\text{ V to } -6\text{ V}$  and  $I_{DSS} = 8\text{ mA}$ . Plot the min and max transconductance curve for the device. 8

**OR**

6. a) Draw a small signal low frequency model of a field effect transistor and explain its various elements. Also give the approximate range of the element. 8
- b) A self bias P-channel JFET has a pinch-off voltage ( $V_P$ ) = 5V and  $I_{DSS} = 12\text{ mA}$ . The supply voltage available is 12V, Determine the value of resistor  $R_D$  and  $R_S$  so that  $I_D = 5\text{ mA}$  and  $V_{DS} = 6\text{ V}$ . 8
7. a) Discuss class-B push pull amplifier and derive the expression for efficiency. 8
- b) Justify how two complementary transistors in class-B push pull amplifier act simultaneously as phase inverters and on output pull push pair. 8

**OR**

8. a) A certain power transistor meant for class-A operation has a zero signal power dissipation of 10W. If the a.c. output power is 4 W. Find 8
- a) Collector efficiency
- b) Power rating of transistor.
- b) Derive the power relation of class-C amplifier. 8
9. a) Obtain the expression for the frequency of oscillation for a phase shift oscillators and show that gain of an amplifier must exceed 20 in this oscillator. Give the feedback factor. 8
- b) A crystal has the following parameter 8
- $L = 0.33\text{ H}$ ,  $C = 0.065\text{ pf}$ ,  $C_2 = 1.0\text{ pf}$  and  $R = 5.5\text{ K}\Omega$ . Find the Series resonant frequency and Q factor of the crystal.

**OR**

10. a) Describe R-C phase shift oscillator. 8
- b) A Colpitts oscillator is designed with  $C_1 = 100\text{ pf}$  and  $C_2 = 7500\text{ pf}$ . The inductance is variable, Determine the range of inductance values, if the frequency of oscillation is to vary between 950 Hz and 2050 KHz. 8

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