B.E. Instrumentation Engineering Third Semester

IN302 - Electronic Devices & Circuits

P. Pages : 3 **GUG/W/18/1509**

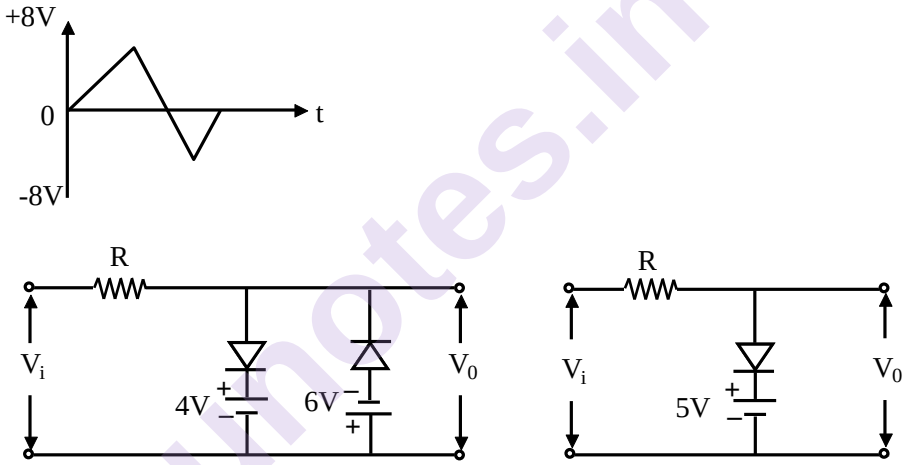
Time : Three Hours * 1 1 8 8 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Same answer book must be used for all question.

1. a) What do you understand by barrier potential cross junction? What is it significance. **4**

b) Draw the VI characteristics in Forward & reverse bias & Explain them. **4**

c) Sketch Vo for each clipping network given below for input shown. Assume the diodes are ideal. **8**



OR

2. a) What is bleeder resistance? Why it is used in L – C filter? **4**

b) Justify that the efficiency of full wave rectifier is twice as compared to half wave rectifier. **4**

c) A full wave rectifier uses a double diode with each element having a constant forward resistance of $500\,\Omega$. The transformer rms secondary voltage from the center tap to each plate is 300 v & load has a resistance of $2.5\,k\,\Omega$. Determine **8**

i) dc output power
ii) ac input power
iii) Rectification efficiency
iv) Voltage regulation from no load to full load.

3. a) Sketch typical CB input characteristics curves for an NPN transistor. Label all variables. How would you calculate the input dynamic resistance of the transistor? **8**

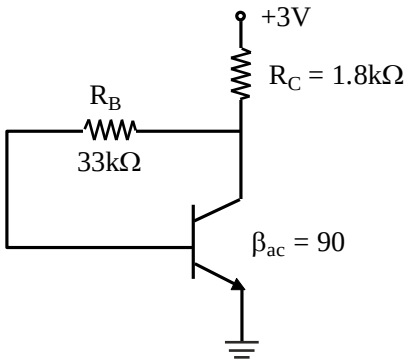
b) In the circuit shown in Fig. $h_{FE} = 100$, $V_{BE} = 0.8$ V $V_{CE} = 0.2$V, determine whether or not the silicon transistor is in saturation & find I_B & I_C. **8**

OR

4. a) A change of 250 V. in base – Emitter voltage causes a change of 1mA in the base current. Determine the dynamic input resistance. **4**

b) What is thermal run way & Heat sink? **4**

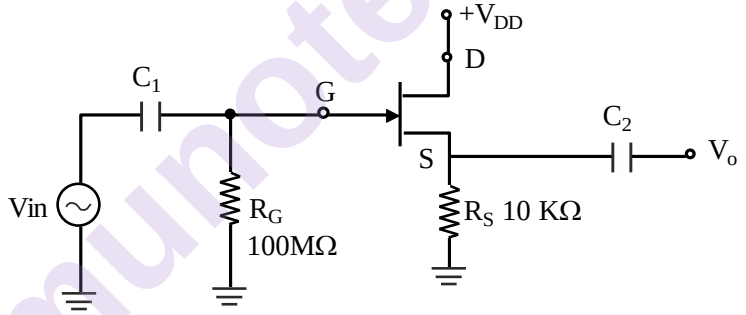
c) Determine the d.c. bias current & voltage for the d.c. bias circuit shown in fig. **8**



Also determine the stability factor of the bias circuit. Assume V_{BE} = 0.7V.

5. a) Explain the transfer characteristics for N-channel & P-channel MOSFETs alongwith their output characteristics of an N – channel Enhancement MOSFET. **8**

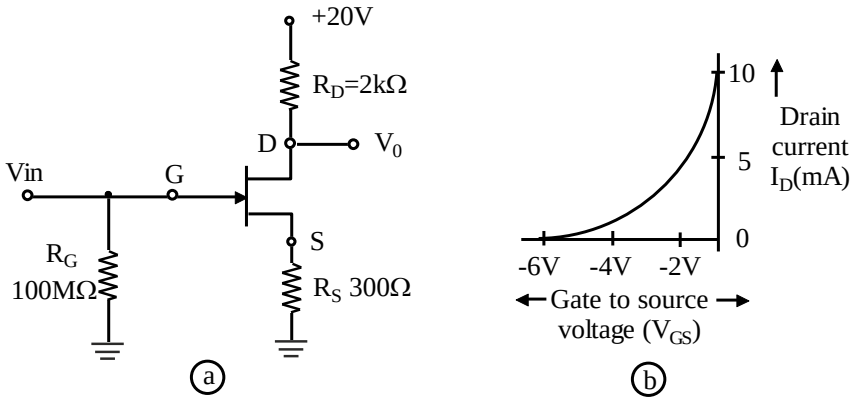
b) Fig. shows the circuit of a source follower. Determine the voltage gain of the amplifier. Also determine the input & output resistance of the amplifier. Assume gm = 800 μs, infinite input resistance & neglect FET output resistance. **8**



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 elements. **8**

b) Fig. a) shows the circuit of a self – biased JFET amplifier and fig b) shows the transfer characteristics. curve of the JFET. Find the quiescent values of ID & V_{GS}. Also find the value of d.c. voltage between the drain and ground. **8**



7. a) Draw the circuit diagram of class – A transformer coupled power amplifier and explain its operation. Derive an expression for its maximum efficiency. **8**

b) Explain the following terms in connection with power amplifier. **8**
i) Collector circuit efficiency.
ii) Collector dissipation rating.
iii) Class A, Class B, Class C, operation.
iv) Harmonic distortion.

OR

8. a) Design a push-pull amplifier to deliver 200 mw to a load of $6\,\Omega$. Assume transformer efficiency to be 70% and V_{CC} = 12 V. **8**

b) What is crossover distortion? How it is eliminated. **4**

c) Differentiate between voltage & power amplifier. **4**

9. a) State the three fundamental assumptions. Which are made in order that the expression $Af = \frac{A}{1+\beta A}$ be satisfied exactly. List five characteristics of an amplifier which are modified by negative feedback. **8**

b) In a transistor Colpitts oscillator **8**
$L = 100\mu H$, $L_{RFC} = 0.6$ mH, $C_1 = 0.001\,\mu F$, $C_2 = 0.01\mu F$ and $10\,\mu F$. Determine
i) Operating frequency ii) Feedback fraction
iii) Minimum gain to sustain oscillations and emitter resistance of Rc = 2.5 K Ω.

OR

10. a) An amplifier with a gain of 60 dB has on output impedance of $10K\,\Omega$. It is required to modify its output impedance to $1k\,\Omega$. What type of feedback has to be applied? Calculate the feedback factor. Also Find the percentage change in the overall gain, for a 10% change in the open – loop gain of the amplifier. **8**

b) What are the Barkhausen condition of oscillation in electronic system? What are their significance? What are the factors which effect the frequency stability of an oscillator? **8**

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