2124
B.E. (Electronics and Communication Engineering)
Third Semester
EC-307: Electronics Devices and Circuits

Time allowed: 3 Hours   **Max. Marks: 50**

NOTE: *Attempt* <u>*five*</u> *questions in all, including Question No. I which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.*

x-x-x

Q1. **Answer the following: -**

   (a)   Why transistor is called current controlled device?   (1)

   (b)   What is power MOSFET?   (1)

   (c)   What is the theoretical maximum efficiency of a Class C amplifier?   (1)

   (d)   What is the significance of the arrow-head in the transistor symbol?   (1)

   (e)   Why silicon type transistors are more often used than germanium type?   (1)

   (f)   What is Shockley equation?   (1)

   (g)   Why is there a maximum limit of collector supply voltage for a transistor?   (1)

   (h)   How α and β are related to each other?   (1)

   (i)   What is the difference between output and transfer characteristics of the MOSFET?   (1)

   (j)   How does a thermistor's response time affect its performance?   (1)

SECTION A

Q2. (a) (i) A germanium transistor is to be operated at zero signal I_C = 1mA. If the   (5) collector supply V_{CC} = 12V, what is the value of R_B in the base resistor method? Take β = 100.
(ii) If another transistor of the same batch with β = 50 is used, what will be the new value of zero signal I_C for the same R_B?

   (b)   In base bias method, how Q-point is affected by changes in V_{BE} and I_{CBO}.   (5)

Q3. (a) What do you understand by 'Bias stability' of a transistor? Why is it necessary?   (5) Explain the working of self-bias circuit for common emitter BJT.

   (b)   What are the advantage and disadvantages of different thermistors.   (5)

Q4.   Annpn silicon transistor has V_{CC} = 6 V and the collector load R_C = 2.5 kΩ. Find: (10)

      (i)   The maximum collector current that can be allowed during the application of signal for faithful amplification.

      (ii)   (ii) The minimum zero signal collector current required

SECTION B

Q5. A common-emitter amplifier with an external capacitor C_C connected across the base and the collector of the transistor is shown in Figure. Determine the upper cutoff frequency f_H of the amplifier. (g_m = 5mA/V, r_π=200KΩ, C_π=1.5 pF and C_μ=0.5 pF)   (10)
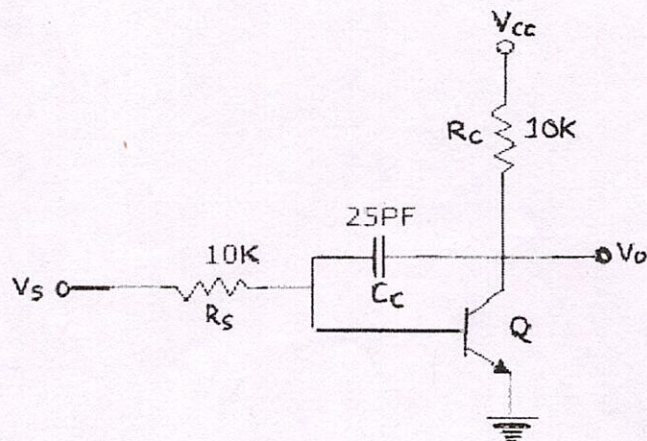
Q6. (a) Differentiate push pull and complementary symmetry class B amplifier.   (5)

   (b)   An amplifier is assumed to have a single pole high frequency transfer function. The rise time of its output response to a step function input is 35 nsec. What is the upper 3 dB frequency (in MHz) for the amplifier to a sinusoidal input?   (5)

Q7. (a) A 1 pF capacitor is available. Choose the inductor values in a Hartley oscillator so that f = 1 MHz and m_v = 0.2.   (5)

   (b)   A JFET has the following parameters - I_{DSS} = 32mA; $V_{GS(off)}$ = -8V; V_{GS} = 4.5V. Find the drain current.   (5)

x-x-x