May, 2023

B.Tech. (EEIOTYENC) IV SEMESTER

Analog Electronics Circuits (ECP-402)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define reverse saturation current of PN Junction Diode. Which diode Si or Ge has more reverse saturation current. Justify your answer.   (1.5)

   (b) The reverse saturation current of an N-P-N transistor in common base circuit is 1 an emitter current of 2 mA, collector current is 1.97 mA. Determine the current gain and base current.   (1.5)

   (c) FET has higher value of input resistance as compared to BJT. Is it true or false. Justify your answer.   (1.5)

   (d) Why DC analysis of differential amplifier circuit is required?   (1.5)

(b) Sketch the circuit of a source follower. At low frequencies what is

   (i) The maximum value of the voltage gain.

   (ii) The order of magnitude of the output impedance
                    (7)

5. (a) Draw the circuit diagram of RC coupled CE Amplifier. Obtain the frequency for voltage gain at low and high audio frequencies. What factors affect the gain of amplifier at low and high frequencies.   (8)

   (b) For a class B Power amplifier providing a 20 V peak signal to 16Ω load and a power supply of V_{cc} = 30 V, Determine the input power, output power and amplifier efficiency.   (7)

6. (a) With proper circuit diagram, explain the operation of Hartley Oscillator. Derive an expression for its frequency and condition of sustained oscillations.   (8)

   (b) Show that the amplifier used in Wien bridge oscillator must have gain greater than 3 for sustained oscillations.
                    (7)

7. (a) Draw schematic and explain working of OP-Amp as an integrator by considering square wave input. Why OP-Amp is mostly used as an integrator than differentiator.   (8)

   (b) Design a non-inverting amplifier circuit that is capable of providing a voltage gain of 10. Assume an ideal operational amplifier and resistors should not exceed 30 KΩ.   (7)

(e) Why Bypass capacitor is needed in amplifier circuits?

(1.5)

(f) Why is it necessary to have positive feedback in oscillators? (1.5)

(g) What is offset error. How it can be reduced? (1.5)

(h) Differentiate between conventional rectifier and precision rectifier. (1.5)

(i) Why the overall gain of multistage amplifier is less than the product of the gains of individual stage. (1.5)

(j) Why a step-down transformer is used in the output stage of Power Amplifier? (1.5)

PART-B

2. (a) In the centre-tap circuit shown in F, the diodes are assumed to be ideal i.e. having zero internal resistance. Find : (i) dc output voltage (ii) peak inverse voltage (iii) rectification efficiency. (6)
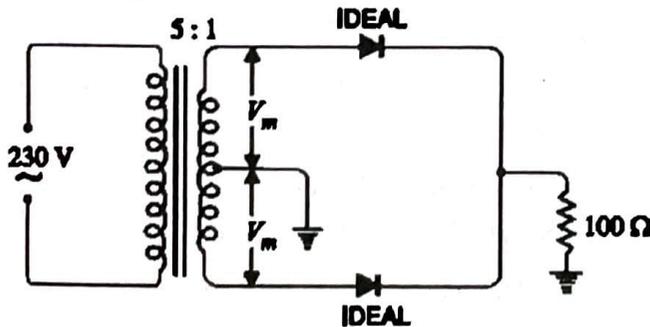

(b) Draw and explain Output V_0 waveform of the following circuit : (5)
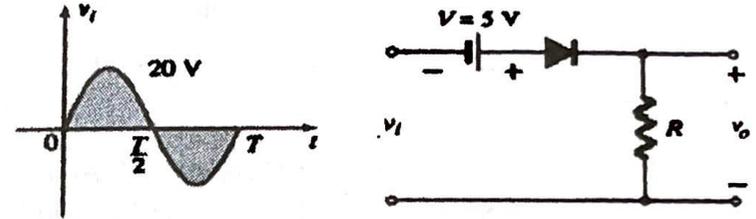
(c) Draw Characteristics of PN Junction at four different temperatures e.g. $-100°C$, $+25°C$, $+100°C$, and $+200°C$. Comment on the curve. (4)

3. (a) Draw h-parameter equivalent circuit of a loaded amplifier in common emitter configuration and derive the expressions for current gain, voltage gain, input impedance and output impedance. (8)

(b) Calculate the emitter current I_E, V_{CE} and collector potential V_C in the following voltage divider circuit. (7)
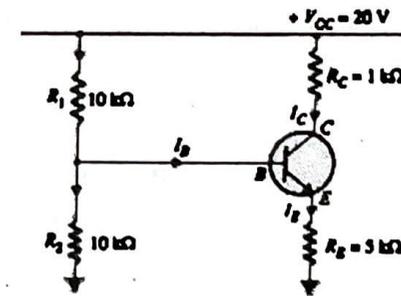
4. (a) Draw the structure of a n channel JFET and explain its principle of operation with neat circuit diagram. Sketch its V-I characteristics. Define pinch off voltage and mark it on its characteristics. Give its importance. (8)