

( 3 Hours )

[ Total Marks : 80 ]

Please check whether you have got the right question paper.

- N.B.:**
- 1) Question No.1 is compulsory.
  - 2) Attempt any three questions from remaining.
  - 3) All questions carry equal marks.
  - 4) Assume suitable data wherever necessary.

Q.1 Attempt any four (04) of the following:

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- (a) Explain high frequency equivalent circuit of bipolar junction transistor (BJT).
- (b) Write short note on the Cascode amplifier configuration.
- (c) What are the advantages & disadvantages of negative feedback ?
- (d) State & explain the Barkhausen's criterion.
- (e) Describe what is cross-over distortion with a neat sketch.
- (f) With neat sketch describe the V-I characteristics of DIAC.

Q.2 (a) Determine the lower & upper cut-off frequency ( $f_L$  &  $f_H$ ) for the single stage common collector (CC) BJT amplifier as shown in Fig. 1 below.

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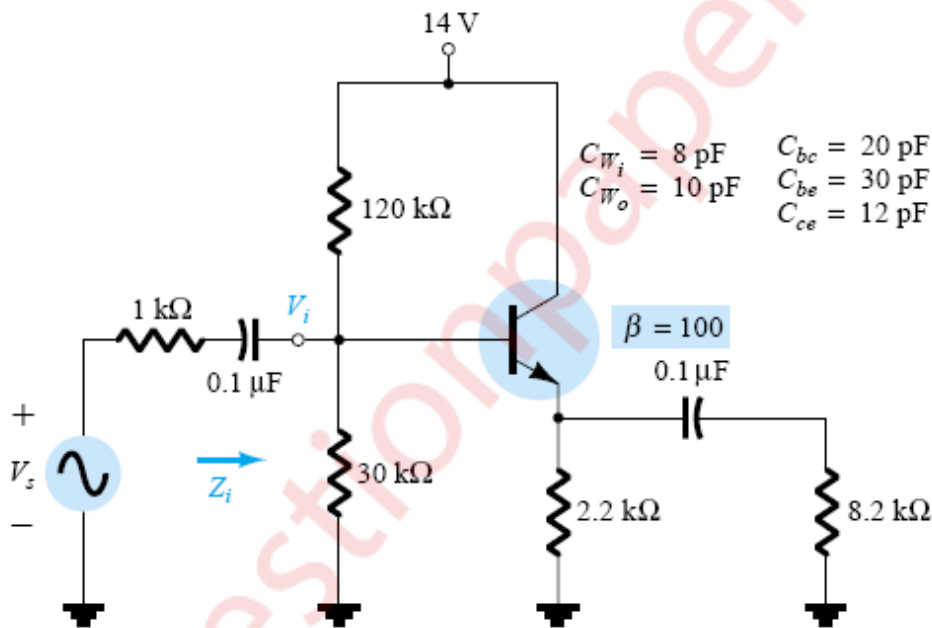


Fig. 1 – Common Collector (CC) BJT Amplifier for Q.2 (a)

Q.2 (b) Explain the high frequency response of CS – JFET amplifier with proper equations. Discuss the effects of various parasitic (inter-electrode & wiring) capacitances.

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Q.3 (a) Draw Class A transformer coupled amplifier & load line, derive the expressions for the maximum overall operating efficiency  $\eta_{o(max)}$  & maximum collector conversion efficiency  $\eta_{c(max)}$ .

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Q.3 (b) Explain Class B push-pull amplifier with neat labeled diagram & derive the expressions for the maximum overall operating efficiency  $\eta_{o(max)}$  & maximum collector conversion efficiency  $\eta_{c(max)}$ .

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Q.4 (a) For the E – MOSFET differential amplifier as shown in the Fig. 2:-

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- (i) Determine the DC operating point (Q – Point)
- (ii) Derive & calculate the differential mode gain ( $A_d$ )
- (iii) Derive & calculate the common mode gain ( $A_c$ )
- (iv) Calculate the common mode rejection ratio (CMRR)

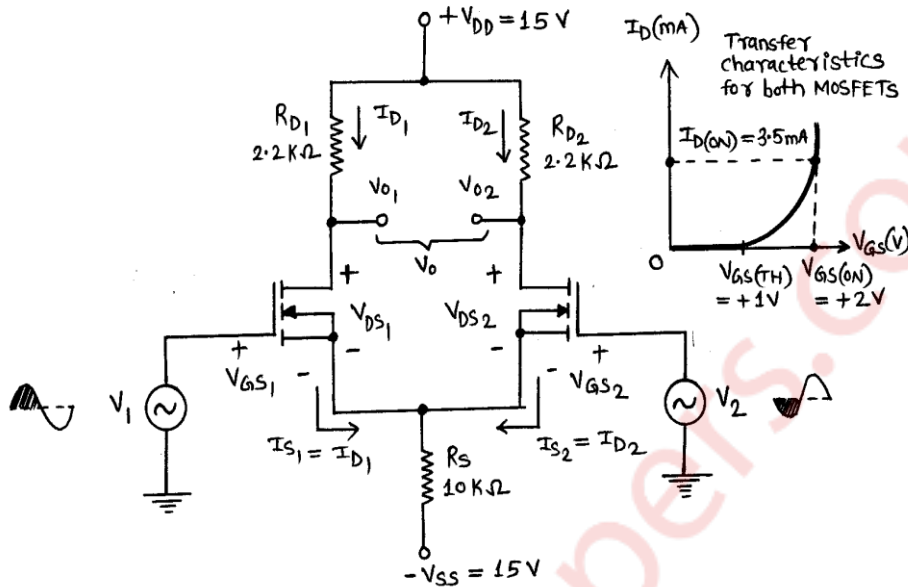


Fig. 2 – The E – MOSFET Differential Amplifier for Q.4 (a)

Q.4 (b) Identify the negative feedback topology as shown in the Fig. 3 below. Analyze to derive the expressions for the input resistance with feedback ( $R_{if}$ ) & output resistance with feedback ( $R_{of}$ ).

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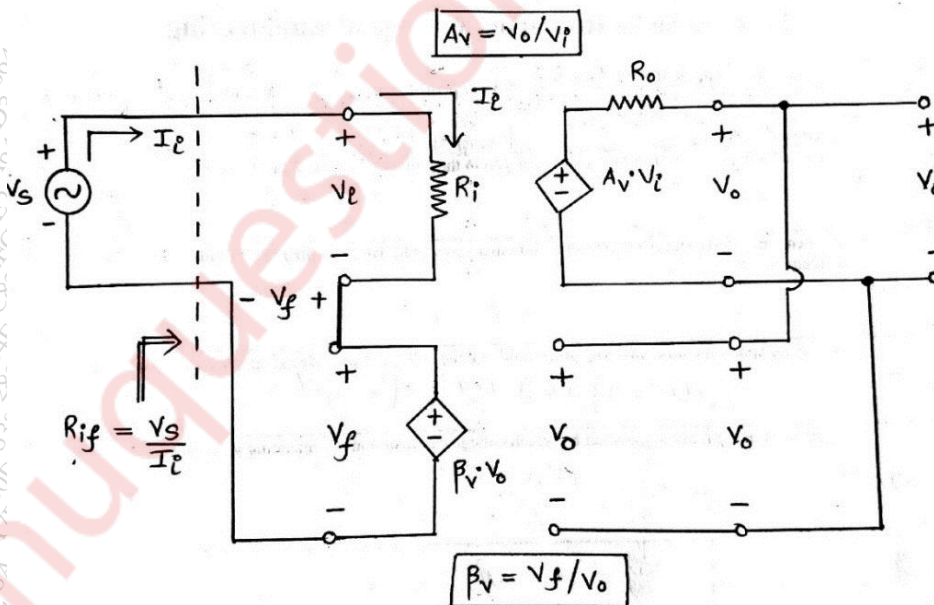


Fig. 3 – Negative Feedback Amplifier Topology for Q.4 (b)

Q.5 (a) With a neat labelled diagram, explain the Hartley oscillator. Describe its advantages & disadvantages. Design the same for 50 kHz. 10

Q.5 (b) Identify the low frequency RC oscillator from the Fig. 4 & explain its working with its advantages & disadvantages. From the given component values, calculate output frequency of oscillations ( $f_o$ ). 10

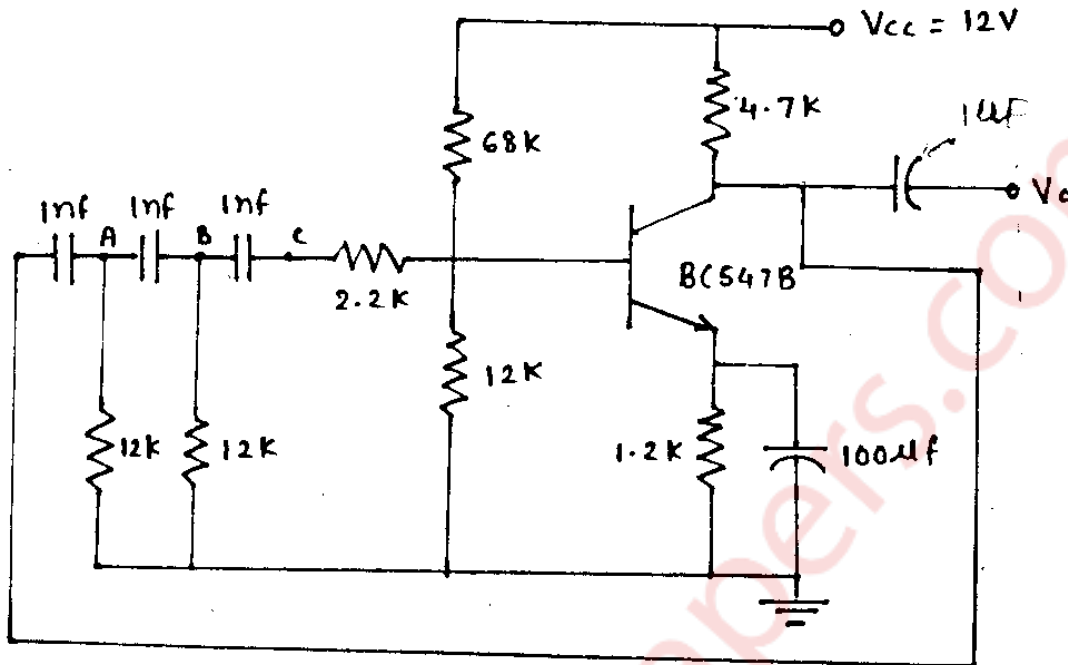


Fig. 4 – The low frequency RC oscillator for Q.5 (b)

Q.6 (a) Explain the working of silicon controlled rectifier (SCR) using the two-transistor analogy with a neat labelled diagram. Draw the structure / construction & V-I characteristics of SCR. 10

Q.6 (b) Describe construction & explain the working of uni-junction transistor (UJT) with neat labelled diagram & V-I characteristics. Define the term ‘intrinsic stand-off ratio’. 10