SE- ELEX - Sem IV - R-19 - C. Scheme   15.5.2025

Time: 3 Hours   Marks: 80

N.B. (1) Q.1 is compulsory.
  (2) Attempt any three (03) out of remaining five (05) questions.
  (3) Figures to the right indicate full marks.
  (4) Assume suitable data wherever necessary but justify the same if required.

Q.1 Attempt any four (04)   20

 (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.

Q.2 (a) Determine the lower cut-off frequency (f_L) for the single stage common collector (CC) BJT
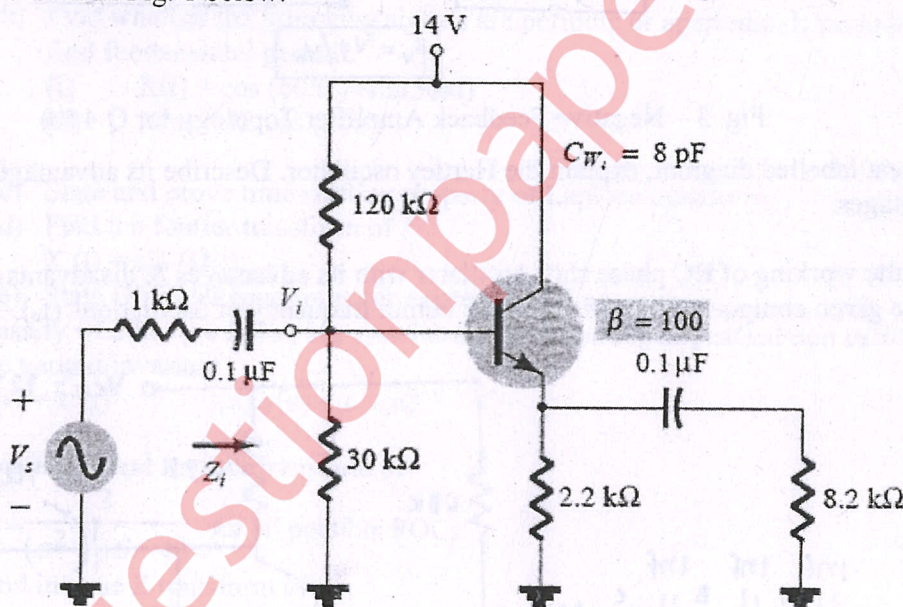   amplifier as shown in Fig. 1 below.   10

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.   10

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 $\eta_{c(max)}$ 10

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 $\eta_{c(max)}$ 10

Q.4 (a) What is the difference between an amplifier and a differential amplifier. Explain the operation of
   differential amplifier in common mode.   10

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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}). 10
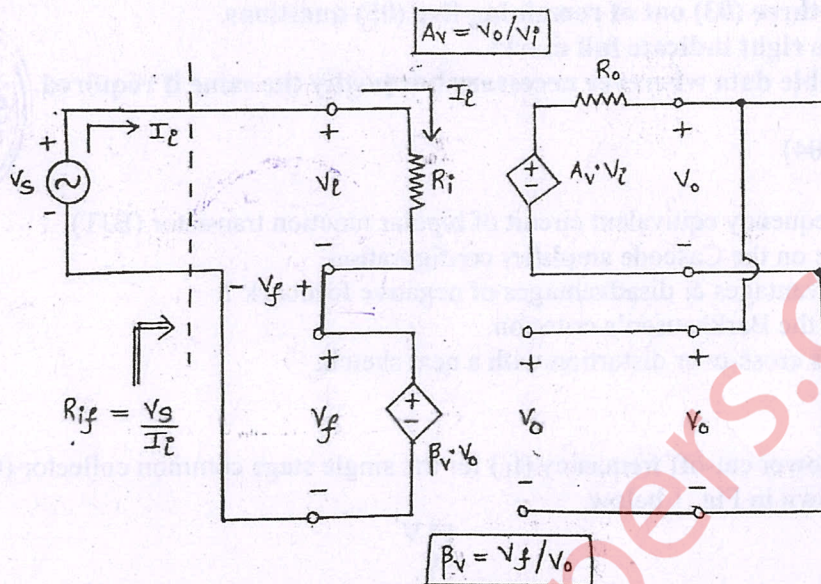
$$A_V = V_o / V_i$$

$$\beta_V = V_f / V_o$$

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. 10

Q.5 (b) Explain the working of RC phase shift oscillator with its advantages & disadvantages. From the given component values, calculate output frequency of oscillations (f_o). 10

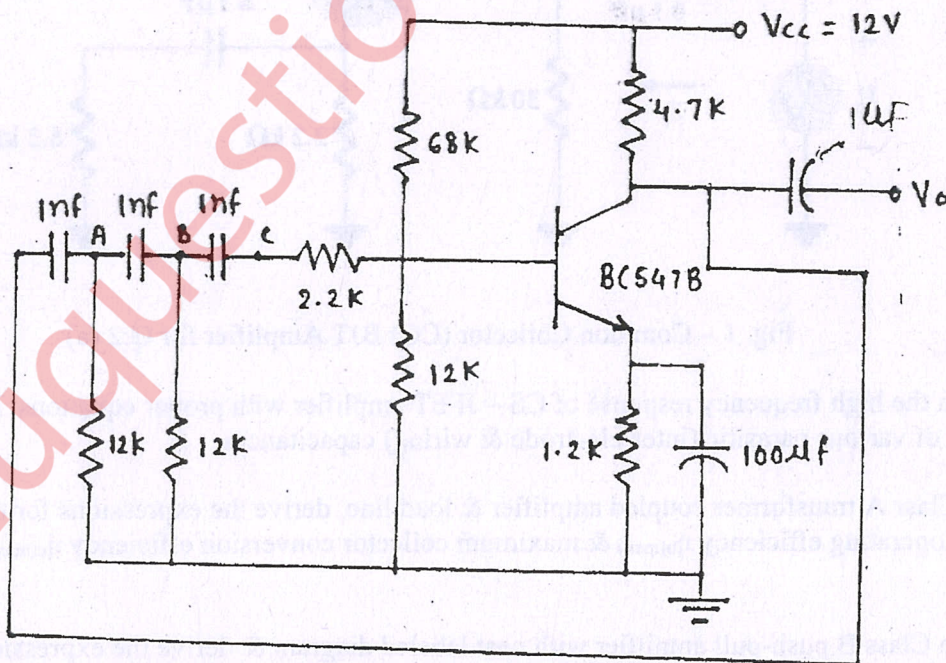Fig. 4 – The low frequency RC oscillator from Q.5 (b)

Q.6 (a) What are the different methods to improve CMRR. Explain any one. 10
Q.6 (b) Explain what is a multistage amplifier? Explain the different types of coupling methods. 10

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