Question Paper

Exam Date & Time: 23-Jan-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH MAKE-UP EXAMINATIONS, JAN-FEB 2023

ANALOG ELECTRONICS [BME 2151]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates:
(i) Answer ALL questions
(ii) Missing data may be suitably assumed
(iii) Draw neat diagrams wherever necessary

1) A) Devise R_B and R_C for a Silicon transistor circuit in common emitter configuration to produce I_B = 36.36µA, V_{CEQ} = 14V and I_{CQ}=11.67mA. Assume V_{CC} = 14V and V_{BB} = 8.7V. (2)

B) A common emitter amplifier employing Ge transistor is biased using voltage divider bias. The various circuit parameters are V_{CC} = 16V, R_C = 3KΩ, R_E = 2KΩ, R_1 = 56KΩ, R_2 = 20KΩ and α = 0.985. Determine: (4)

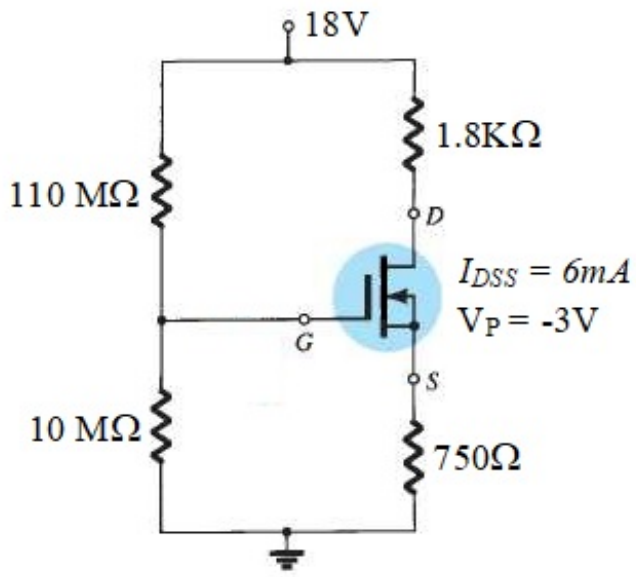
i. Operating point

ii. Stability factor "S"

C) Bias an NPN transistor in fixed bias configuration and derive an expression for stability factor "S". (4)

2) Determine V_{GSQ}, I_{DQ} and V_{DSQ} of the following circuit using graphical analysis. (4)

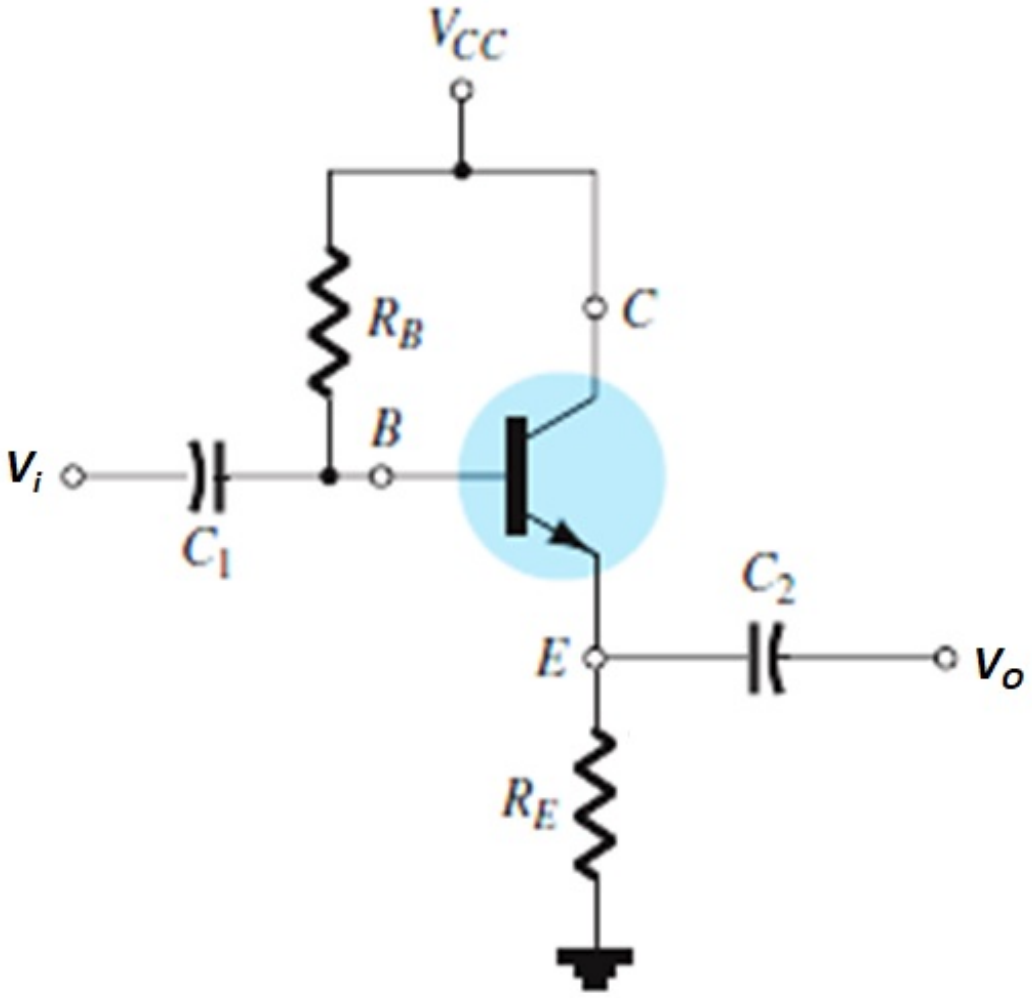
A)



B) Making use of a tuned circuit with two capacitors and one inductor, how do you generate sinusoidal (3)

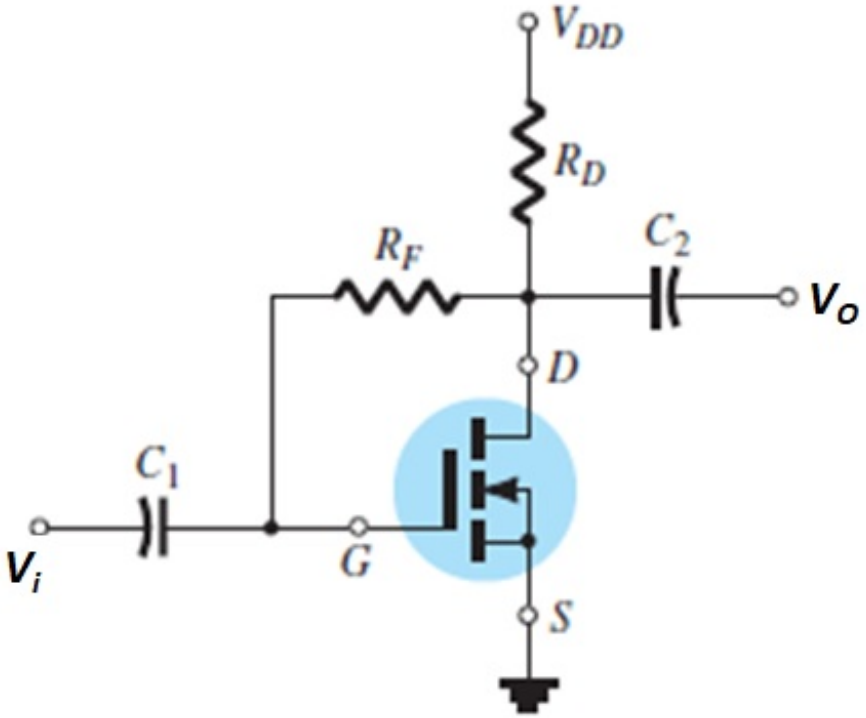
frequency of 10 MHz? Illustrate.

C) Draw the small signal model of the following circuit and analyse it for input and output impedances. (3)



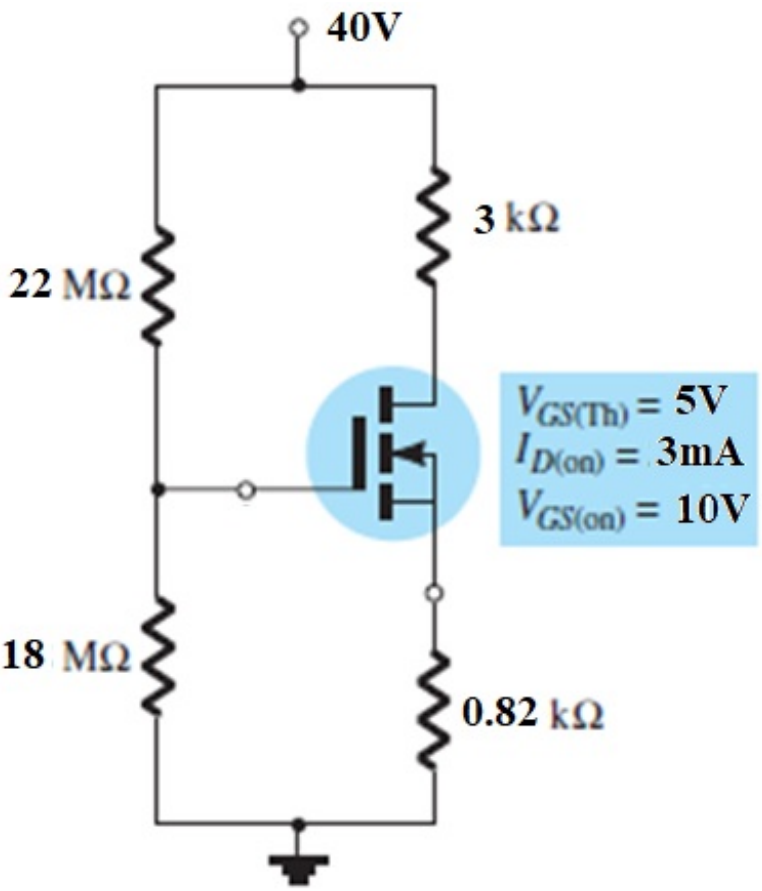
3) Develop a small signal model of the following circuit and estimate input & output impedances and voltage gain. (4)

A)



B) For the circuit shown below, having I_{DQ} = **6.7mA** and V_{GSQ} = **12.5V**, and g_{os} = **20µS**. (4)

1. Determine g_m
2. Find r_d
3. Calculate Z_i
4. Find Z_o with and without r_d
5. Find A_v with and without r_d

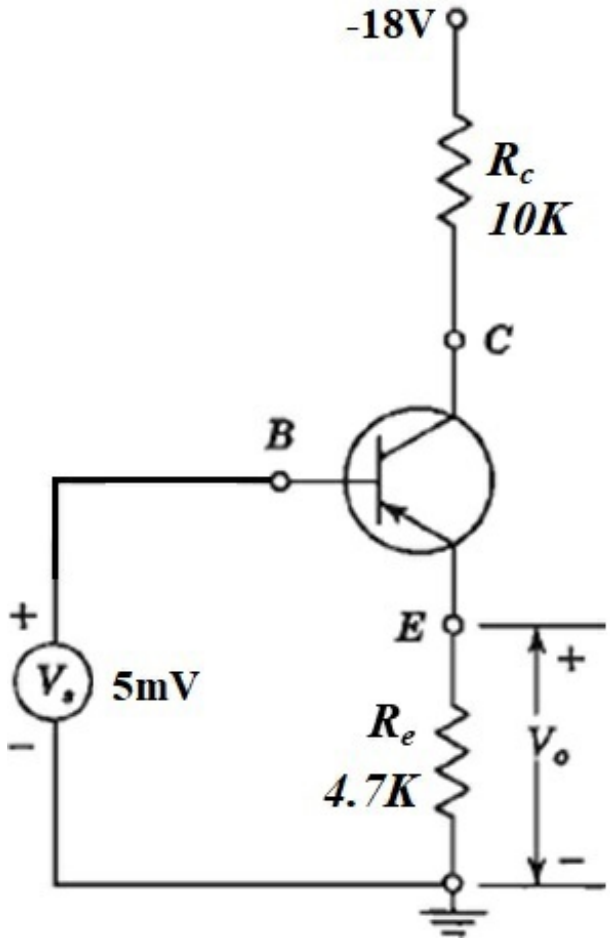


C) Write any two advantages and any two drawbacks of Class-A power amplifier. (2)

4) Draw circuit diagram and equivalent ac circuit (considering the loading effect of feedback network) of a BJT based voltage-series feedback amplifier, and derive input impedance and voltage gain with feedback. (4)

A)

B) Determine output voltage, input impedance and output impedance of the following circuit. Assume V_S = 5mV, R_S = 0Ω, h_{fe} = 50, h_{ie} = 1.1KΩ and h_{re} = h_{oe} = 0. (4)

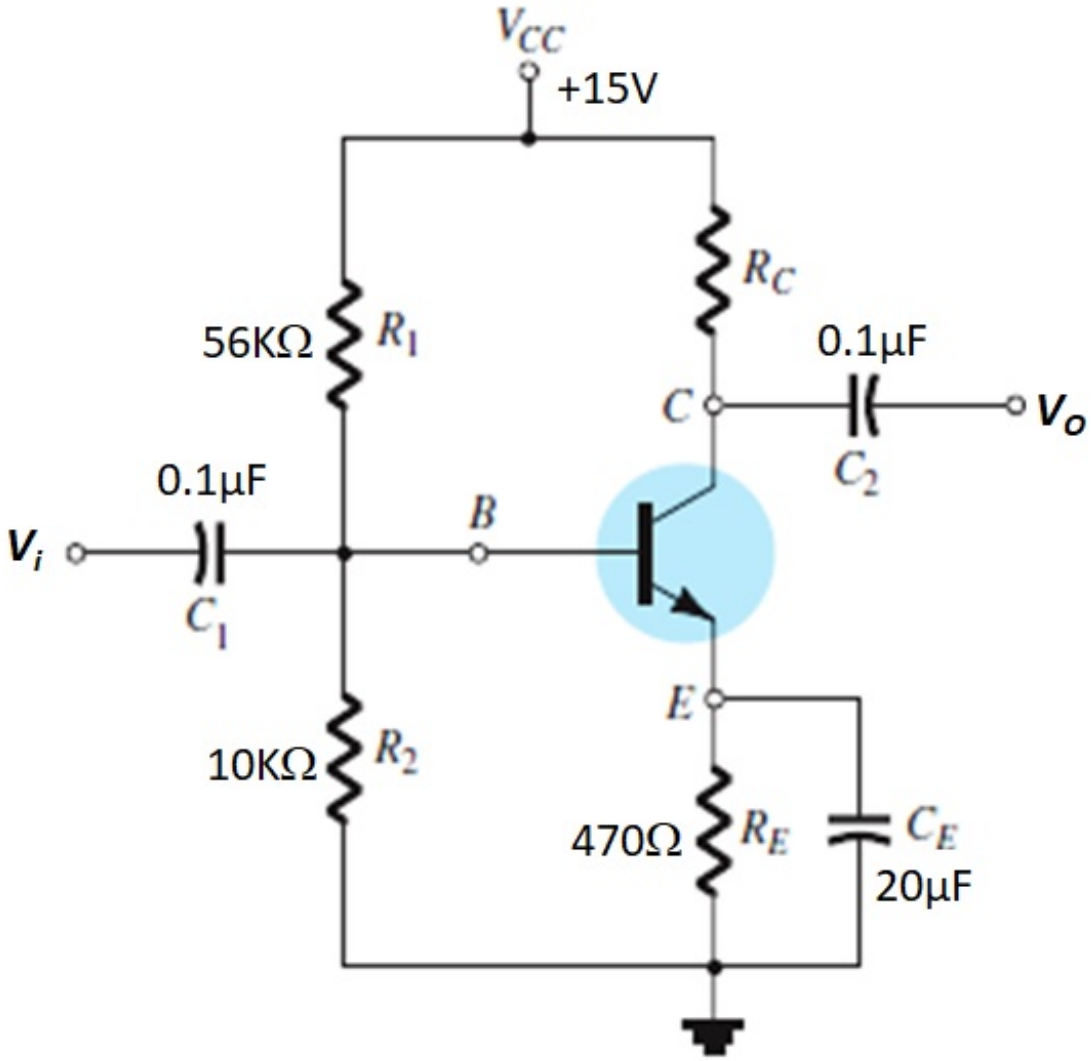


C) What is de-sensitivity in feedback amplifiers? How it affects the characteristics of amplifiers? (2)

5) Define and explain Barkhausen criteria. (2)

A)

B) Modify the following amplifier circuit in to a sinusoidal oscillator to produce sustained oscillations of frequency 5 KHz. Also determine the value of R_C required. Assume $r_o = \infty$ and Silicon transistor. (4)



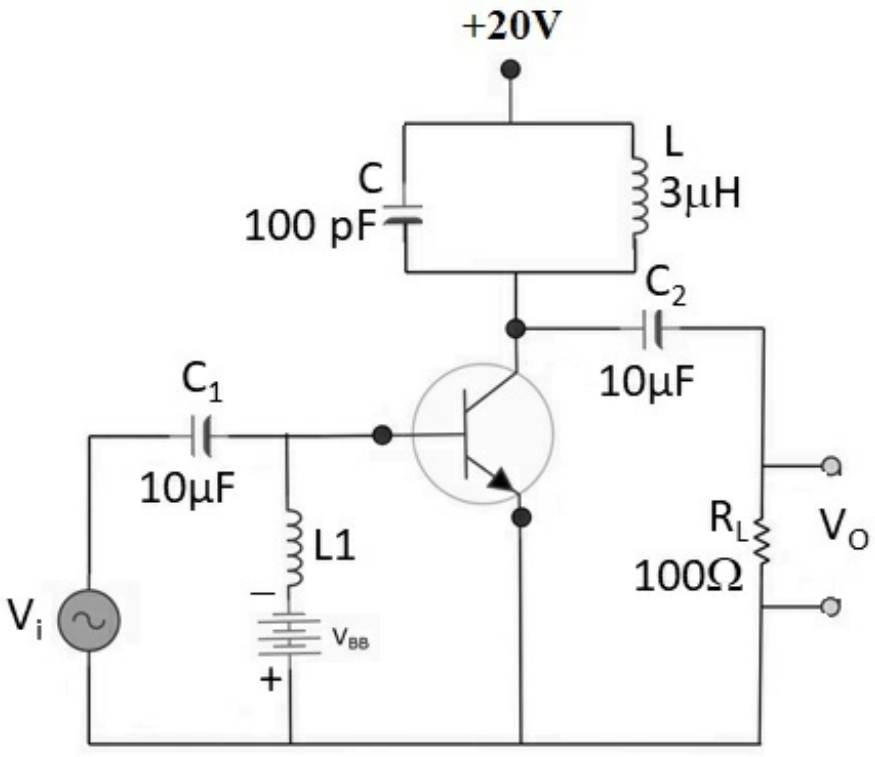
C) For the power amplifier shown below, the operating frequency is 3MHz and $V_{CE(Sat)}$ = 0.3V. Determine: (4)

i. A.C power output

ii. D.C power drawn by the circuit

iii. Efficiency, and

iv. Conduction angle, if peak current is 500 mA



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