Paper id: 252676

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BTECH
(SEM IV) THEORY EXAMINATION 2024-25
ANALOG CIRCUITS

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

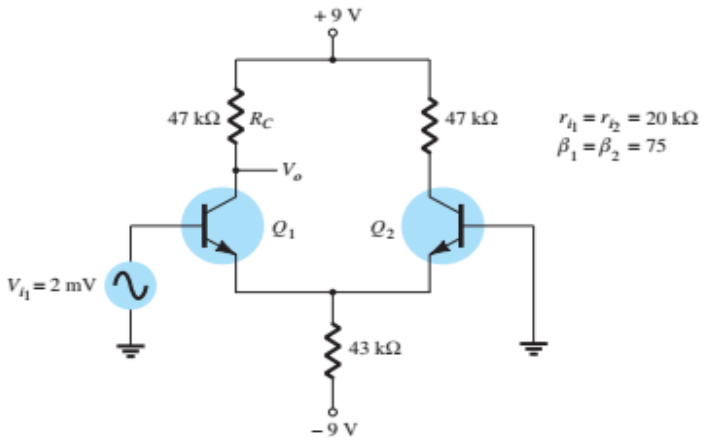
SECTION A

1. Attempt *all* questions in brief. **02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define Transconductance and Trans-resistance Amplifiers.	1	K1
b.	Draw T-model equivalent circuit of NPN transistor.	1	K1
c.	Explain Bakhausen criterion.	3	K2
d.	What is the principle of crystal oscillator?	3	K1
e.	Define minimum sustainable voltage and maximum usable load of a Current mirror Circuits	4	K1
f.	What do you mean by slew rate and CMRR of an Op-Amp?	5	K2
g.	A BJT having β = 100 is biased at a dc collector current of 1 mA. Find the value of g_m and r_e.	2	K3

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	Draw the circuit diagram of single stage CE amplifier using hybrid-π model and find out the expression of i_e, g_m and i_b.	1	K3
b.	Design a shunt-series feedback amplifier and calculate expressions for A_f, R_{of} and R_{if}.	2	K6
c.	Explain the working of Wien Bridge Oscillator. Derive the expression for feedback factor (β) and frequency (f).	3	K3
d.	Calculate the output voltages of the given differential amplifier. 	4	K3
e.	Design the following circuits using op-Amp: i) Unity gain amplifier ii) Integrator circuit	5	K6

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SECTION C

3. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Draw the circuit diagram of single stage CC amplifier using T-model and find out the expression of voltage gain.	1	K3
b.	Show the effect of multi stage amplification in low and high frequency applications.	1	K6

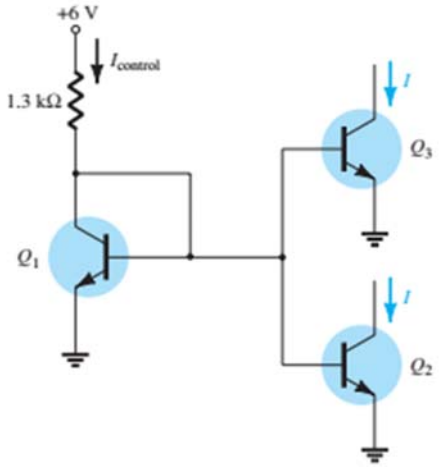
4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Draw the high frequency model of MOSFET and drive an expression of f_H.	2	K3
b.	Design a series-series feedback amplifier and calculate expressions for A_f, R_{of} and R_{if}.	2	K6

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Draw the circuit of an RC phase shift oscillator using op-amp and derive frequency and condition of oscillation for RC phase shift oscillator.	3	K3
b.	For the Hartley Oscillator, derive an expression for the frequency of oscillation.	3	K3

6. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Draw the basic structure of differential amplifier and calculation the differential gain, common mode gain and CMRR.	4	K3
b.	Calculate the current I through each of the transistor $Q2$ and $Q3$ in the given circuit. 	4	K3

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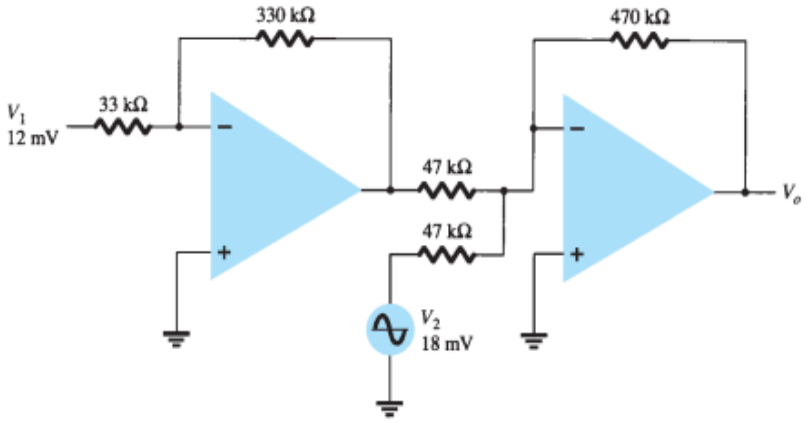
7. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain the effect of finite loop gain and bandwidth on the performance of Op-Amp. Also define input offset voltage and input offset current.	5	K2
b.	Find out the output voltage (V_o) of the following circuit using ideal Op-Amp. 	5	K3

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