Paper id: 252694

Roll No: | | | | | | | | | | | | | |

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

TIME: 3 HRS **M.MARKS: 100**

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

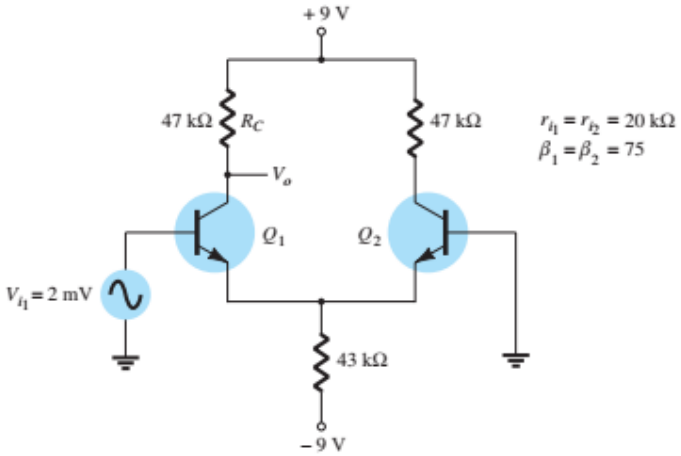
SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q No.	Question	CO	Level
a.	Write down the applications of a current mirror circuit.	4	K1
b.	Draw T-model equivalent circuit of NPN transistor.	1	K1
c.	Explain Barkhausen criterion.	3	K2
d.	Explain the principle of crystal oscillator?	3	K1
e.	Define minimum sustainable voltage and maximum usable load of a Current mirror Circuits.	4	K1
f.	Explain the physical significance of CMRR in noisy environment.	5	K1
g.	Define Transconductance Amplifiers.	1	K1
h.	What do you mean by offset voltage of an Op-Amp?	5	K2
i.	Derive the relationship between α and β.	2	K3
j.	A BJT having β = 50 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: **10 x 3 = 30**

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 transconductance.	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) Logarithmic amplifier ii) Integrator circuit	5	K6

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SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

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

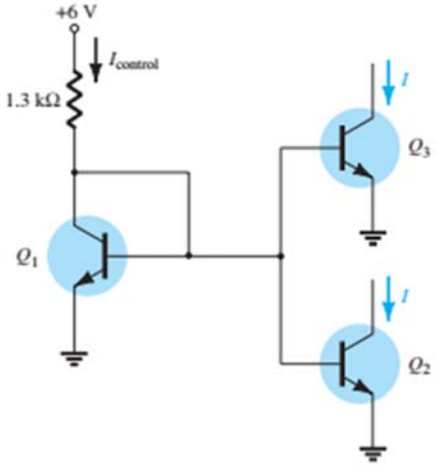
4. Attempt any *one* part of the following: 10 x 1 = 10

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-shunt feedback amplifier and calculate expressions for A_f, R_{of} and R_{if}.	2	K6

5. Attempt any *one* part of the following: 10 x 1 = 10

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.	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: 10 x 1 = 10

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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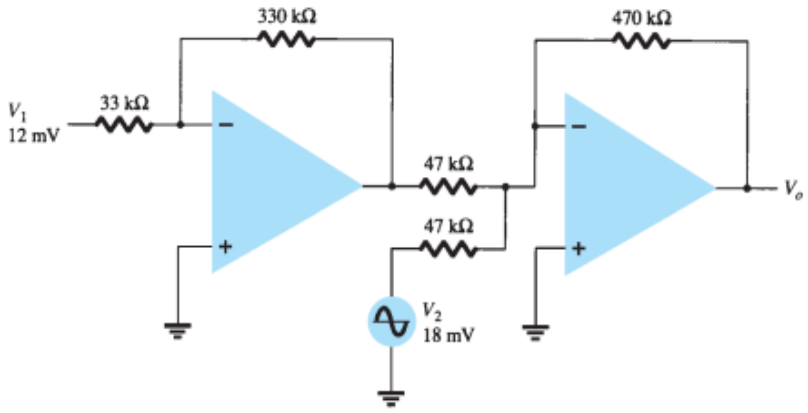
7. Attempt any *one* part of the following: 10 x 1 = 10

Q No.	Question	CO	Level
a.	Explain the effect of finite loop gain and bandwidth on the performance of Op-Amp considering non-inverting configuration.	5	K2
b.	Find out the output voltage (V_o) of the following circuit using ideal Op-Amp. 	5	K3