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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2021 - 2022)

Subject: Analog Circuits

Time: 3 Hours

Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 mark each & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

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1. Attempt all parts:-

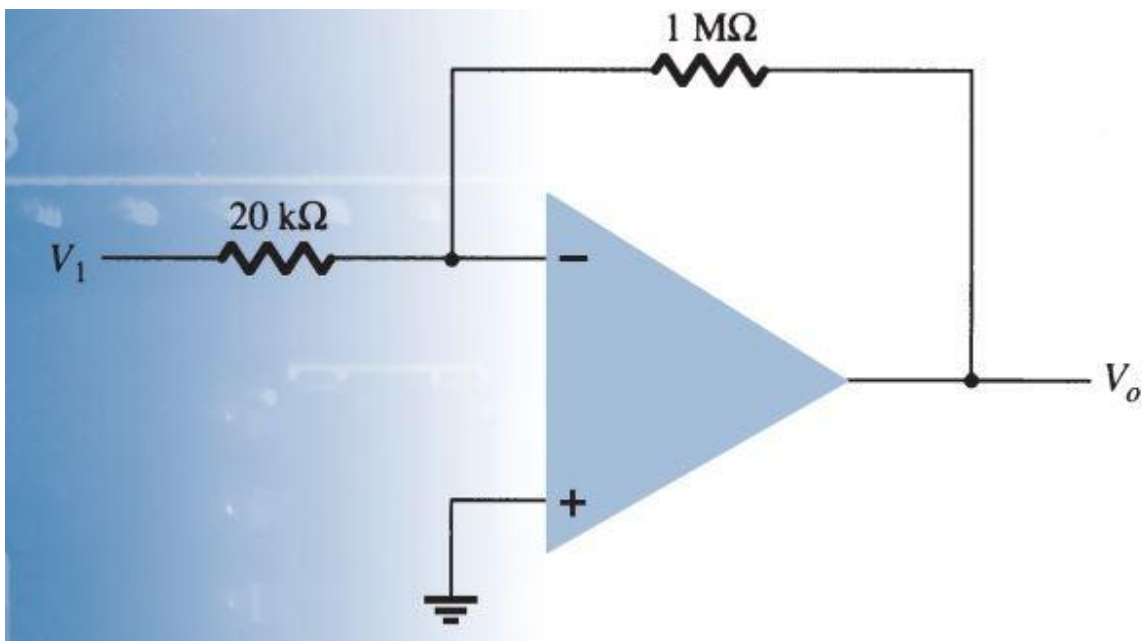
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|------|--|----------------|
| 1 | What is the disadvantage of a class B push-pull amplifier? (CO1) | 1 |
| | <ul style="list-style-type: none"> (a) The efficiency reduces (b) The figure of merit increases (c) The cross-over distortion occurs (d) The Q-power dissipation is very large | |
| 1 | Which of the following Power amplifier have the highest linearity and lowest distortion? (CO1) | 1 |
| | <ul style="list-style-type: none"> (a) Class A (b) Class B (c) Class C (d) Class B push-pull | Type your text |
| 1 | An ideal operational amplifier has _____ (CO2) | 1 |
| | <ul style="list-style-type: none"> (a) infinite output impedance (b) zero input impedance (c) infinite bandwidth (d) All of the above | |
| 1 | Another name for a unity gain amplifier is _____. (CO2) | 1 |
| | <ul style="list-style-type: none"> (a) difference amplifier (b) comparator (c) single ended (d) voltage follower | |
| 1-e. | Which among the following is a nonlinear application of op-amp? (CO3) | 1 |
| | <ul style="list-style-type: none"> (a) V to I converter (b) Comparator (c) Precision rectifier (d) Instrumentation amplifier | |
| 1-f. | The time period of a Pulse obtained by monostable 555 multivibrator is given by _____.(CO3) | 1 |
| | <ul style="list-style-type: none"> (a) $T = 0.33RC$ (b) $T = 1.1RC$ (c) $T = 3RC$ | |

(d) $T = RC$

- 1-g. What is an angle of phase shift for each designed RC network in the RC Phase Shift Oscillator circuit? (CO4) 1
(a) 30°
(b) 60°
(c) 90°
(d) 180°
- 1-h. A Hartley oscillator is used for generating _____. (CO4) 1
(a) Very low frequency oscillations
(b) Radio frequency oscillations
(c) Audio- frequency oscillations
(d) Microwave oscillations
- 1-i. In practical application of current mirror, early voltage V_A is assumed to be _____. (CO5) 1
(a) Infinite
(b) Zero
(c) Unity
(d) None of the mentioned
- 1-j. Which current mirror circuit exhibits a very high output resistance? (CO5) 1
(a) Simple current mirror
(b) Wilson current mirror
(c) Widlar current mirror
(d) All of the mentioned

2. Attempt all parts:-

- 2.a. What do you understand by frequency response of amplifier? (CO1) 2
- 2.b. What input voltage V_1 results in an output of 2 V in the circuit of given Figure. (CO2) 2



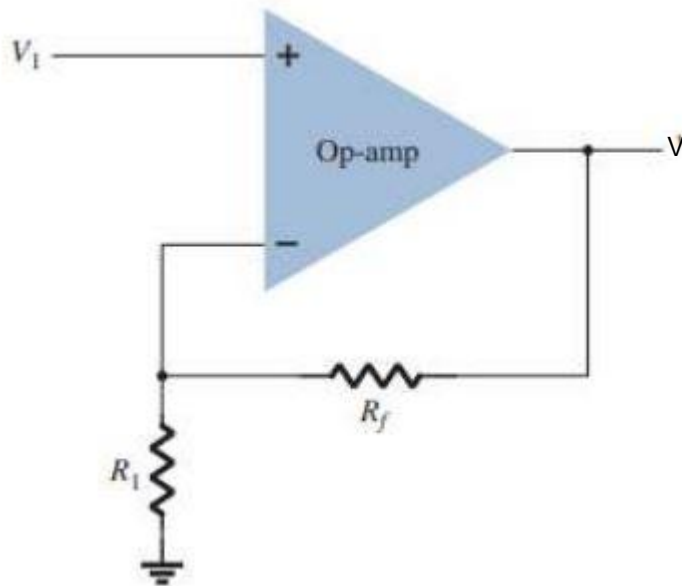
- 2.c. List out the applications of PLL. (CO3) 2
- 2.d. Explain the Barkhausen Criterion for sustained Oscillations. (CO4) 2
- 2.e. Why we need BJT base current compensation mirror circuit? (CO5) 2

SECTION B

30

3. Answer any five of the following:-

- 3 Explain the operation of class B Power amplifier with necessary waveforms. (CO1) 6
- 3 Prove that the input impedance is increased in voltage series feedback amplifier. (CO1) 6
- 3-c. What are the factors that affects the input offset voltage, input bias, and input offset currents? (CO2) 6
- 3-d. Calculate the output voltage of a non-inverting amplifier(as in figure) for values of $V_1 = 10$ V, $R_f = 500$ kohm, and $R_1 = 1000$ kohm. (CO2) 6



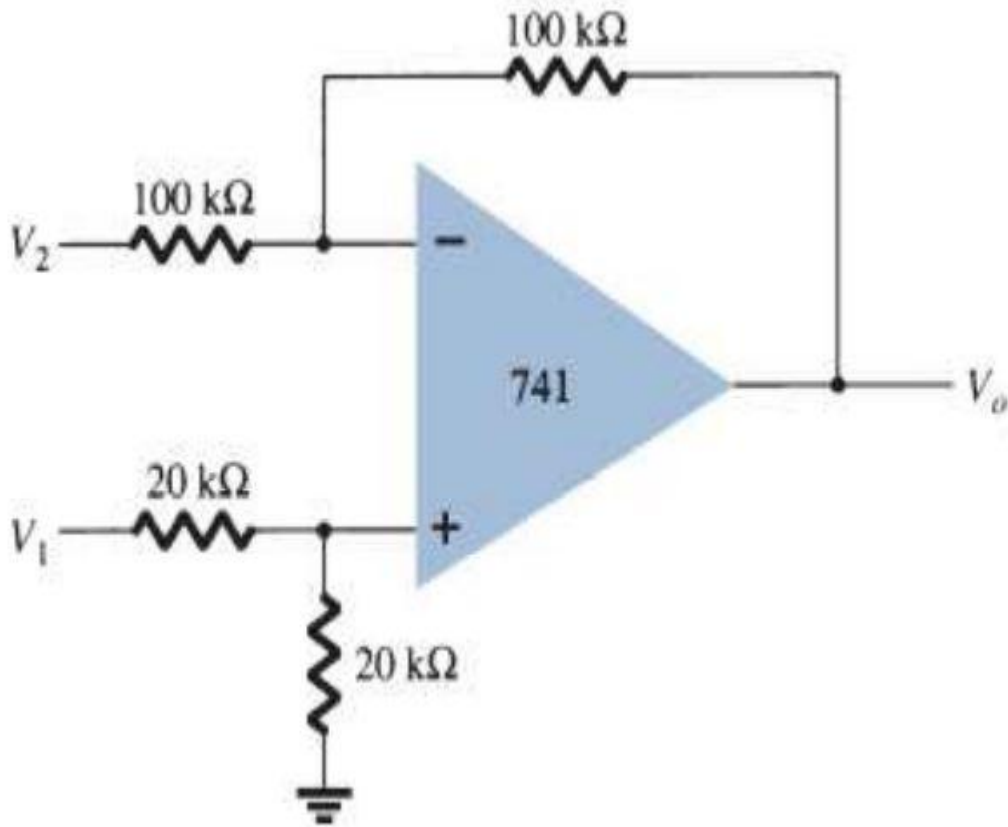
- 3.e. Calculate the duty cycle for the astable multivibrator using IC-555. Given that $R_A = R_B = 2K$ Ω and $C = 1000PF$. (CO3) 6
- 3.f. What is Oscillator? A LC tank circuit contains an inductance of 1 mH. Find out the range of tuning capacitor value if the resonant frequency ranges from 540 – 1650 kHz. (CO4) 6
- 3.g. Explain the circuit of Wilson BJT current mirror. Also discuss how it can be improved. (CO5) 6

SECTION C

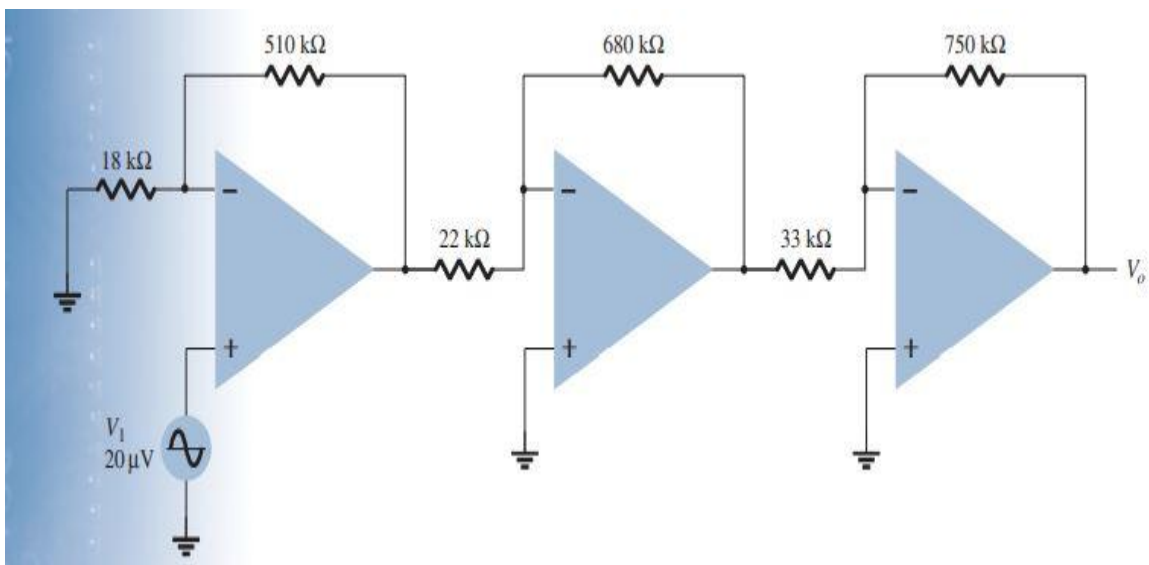
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4. Answer any one of the following:-

- 4-a. Explain the current series feedback amplifier and also derive expression for amplifier gain, input impedance, and output impedance. (CO1) 10
- 4-b. Calculate parameters to draw the frequency response of CE Amplifier by removing the bypass capacitor. (CO1) 10
5. Answer any one of the following:-
- 5-a. Determine the output voltage for the circuit of fig. $V_1 = 10$ Volt and $V_2 = 20$ Volt. (CO2) 10

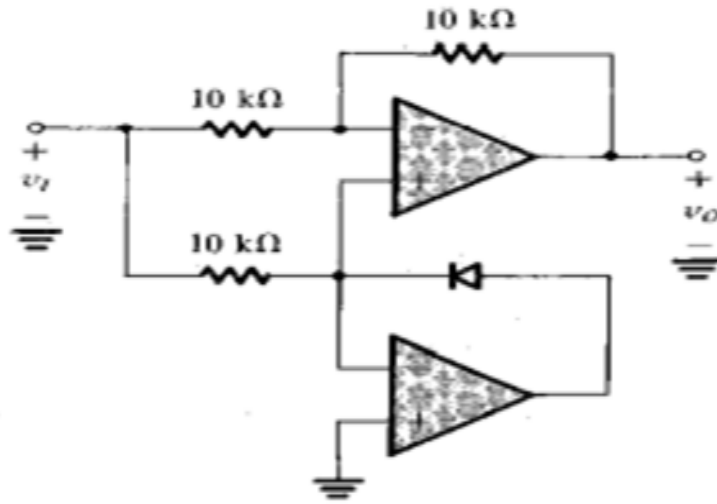


5-b. Calculate the output voltage V_o in the circuit shown in figure. (CO2) 10



6. Answer any one of the following:-

- 6-a. Draw and Explain the Schmitt Trigger Circuit with hysteresis curve. (CO3) 10
- 6-b. Sketch the transfer characteristics of the circuit shown in Fig. (CO3) 10



7. Answer any one of the following:-

- 7-a. Draw Hartley Oscillator Circuit. In a Hartley oscillator, the value of the capacitor in the tuned circuit is 500 pF and the two sections of coil have inductances $38 \mu\text{H}$ and $12 \mu\text{H}$. Find the frequency of oscillations and the feedback factor β . (CO4) 10
- 7-b. With a neat diagram, explain about Wien Bridge oscillator and derive the expression for frequency of oscillation and condition of oscillation. What are the factors which affect the frequency stability of an oscillator? (CO4) 10

8. Answer any one of the following:-

- 8-a. Explain Wilson current mirror and Widlar current Mirror using BJT with circuit diagram. (CO5) 10
- 8-b. Explain simple current mirror circuit using MOSFET and derive current transfer ratio and other parameter. (CO5) 10