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# B.M.S. College of Engineering, Bengaluru-560019

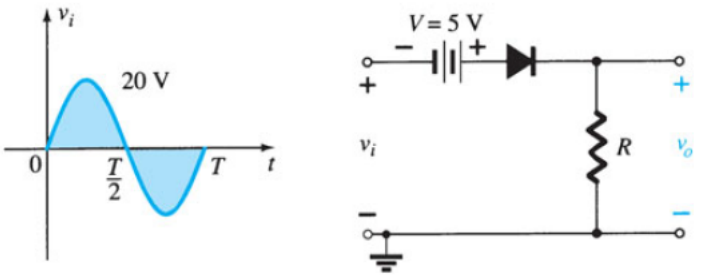
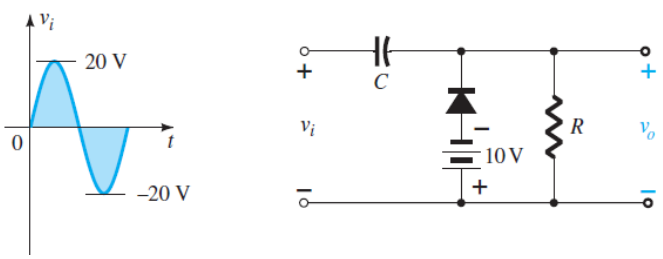
**Autonomous Institute Affiliated to VTU**

## June 2025 Semester End Main Examinations

**Programme: B.E.** **Semester: IV**
**Branch: Electrical and Electronics Engineering** **Duration: 3 hrs.**
**Course Code: 22EE4PCAEL** **Max Marks: 100**
**Course: Analog Electronic Circuits and LIC**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | UNIT - I | CO | PO | Marks |
|---|---|---|---|---|---|
| 1 | a) | What is mean by transistor biasing? Using exact analysis, obtain expressions for $I_B$, $I_C$, $V_{CE}$. | CO1 | PO2 | **10** |
| | b) | Determine the output waveform for the sinusoidal input of fig 1.b   fig 1 b | CO3 | PO2 | **10** |
| | | **OR** | | | |
| 2 | a) | From fundamentals, derive the $r_e$ equivalent model of an npn BJT with voltage divider bias circuit. Derive the expressions for voltage gain, current gain, input impedance and output impedance. | CO2 | PO2 | **10** |
| | b) | Obtain $V_0$ for the network shown in figure 2.b. Give step-by step procedure to obtain the output voltage. Assume ideal diode   fig 2 b | CO3 | PO3 | **10** |

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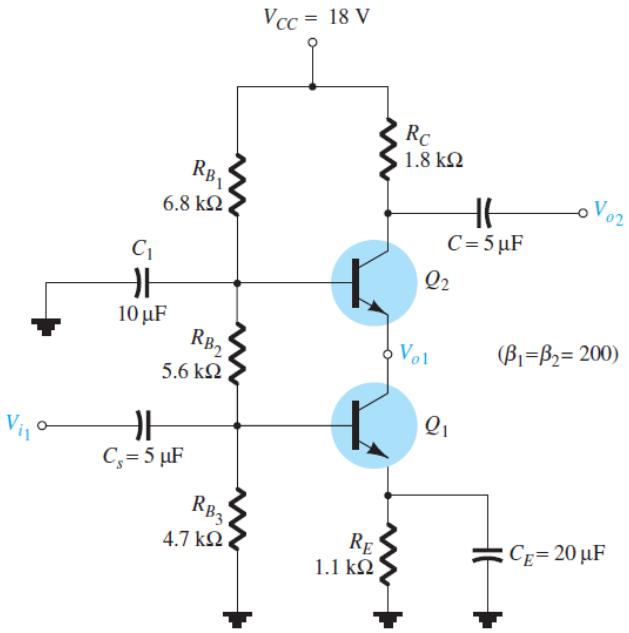
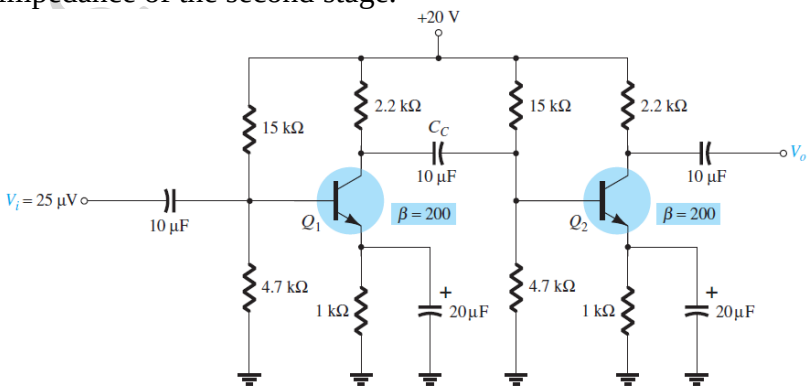
| | | | **UNIT - II** | | | |
| | 3 | a) | Draw the four basic feedback network connections and mark all the significant parameters in it. Derive the expressions of gain, input impedance and output impedance of voltage series feedback amplifier. | *CO3* | *PO2* | **10** |
| | | b) | Calculate the no-load voltage gain for the cascode configuration of fig 3 b   Fig 3 b | *CO3* | *PO2* | **10** |
| | | | **OR** | | | |
| | 4 | a) | a. Calculate the no-load voltage gain and output voltage of the RC -coupled transistor amplifiers of Fig. 4 a.<br>b. Calculate the overall gain and output voltage if a 4.7 kΩ load is applied to the second stage, and compare to the results of part (a).<br>c. Calculate the input impedance of the first stage and the output impedance of the second stage.   Fig 4 a | *CO3* | *PO2* | **10** |
| | | b) | Draw the practical circuit of current series feedback and derive the expressions of voltage gain, input and output impedances. | *CO2* | *PO2* | **10** |

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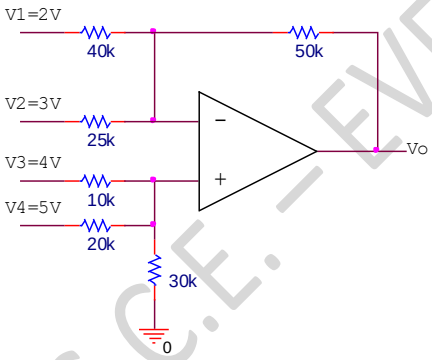
| | | | **UNIT - III** | | | |
| | 5 | a) | With neat structural diagram and waveforms, describe the working of n-channel depletion type MOSFET. Draw output and transfer characteristics | *CO2* | *PO2* | **10** |
| | | b) | For a class B amplifier using a supply of $V_{CC}$ = 30 V and driving a load of 16Ω, determine the maximum input power, output power, and transistor dissipation. | *CO3* | *PO2* | **10** |
| | | | **OR** | | | |
| | 6 | a) | Derive the expression for maximum efficiency of a series- fed class A amplifier. | *CO2* | *PO2* | **10** |
| | | b) | With neat structural diagram and waveforms, describe the working of n-channel enhancement type MOSFET. Draw output and transfer characteristics | *CO2* | *PO2* | **10** |
| | | | **UNIT - IV** | | | |
| | 7 | a) | What is a band pass filter? With a circuit diagram, describe the operation of an opamp based band pass filter. Draw the frequency response. | *CO2* | *PO2* | **10** |
| | | b) | Find Vo for the adder-subtractor shown   | *CO4* | *PO2* | **10** |
| | | | **OR** | | | |
| | 8 | a) | With neat circuit diagrams, describe the working of inverting and non-inverting op-amp configurations. Derive the expression of output voltage in both the cases. Plot the waveforms for a sinusoidal input | *CO3* | *PO2* | **10** |
| | | b) | With a neat circuit diagram, explain the operation of an instrumentation amplifier. List the important features and any two applications of instrumentation amplifier | *CO3* | *PO2* | **10** |
| | | | **UNIT - V** | | | |
| | 9 | a) | (i) Sketch and explain the circuit of (i) Voltage to current converter with grounded load (ii) Current to voltage converter with floating load with relevant mathematical equations. Also, mention its applications. | *CO3* | *PO2* | **10** |

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| | | | (ii) Draw the input and output waveforms of a non-inverting comparator with negative Vref. | | | |
| | | b) | With relevant circuit diagram and waveforms describe the operation of RC phase shift oscillator. Derive the expression for frequency of operation. | *CO2* | *PO2* | **10** |
| | | | **OR** | | | |
| | 10 | a) | Design an op-amp differentiator that will differentiate an input signal with $f_{max}$=100Hz. Draw the output waveform for a square wave input of 1V peak at 100Hz applied to the differentiator. Assume C1=0.1µF. | *CO4* | *PO2* | **10** |
| | | b) | With relevant circuit diagram and waveforms describe the operation of a triangular wave generator. Derive the expression for frequency of operation. | *CO2* | *PO2* | **10** |

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