



**Third Semester B.E. Degree Examination, Dec.2023/Jan.2024**  
**Analog Electronics Circuits and Op-Amps**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

**Module-1**

- 1 a. What is stabilization? Derive an expression for stability factor  $S_{ICO}$  and  $S_{VBE}$  of voltage divider bias circuit. (10 Marks)
- b. For the clipper circuit shown in Fig. Q1 (b), the input is  $50\sin\omega t$ . Draw the transfer characteristics and I/P and O/P waveforms, assuming ideal diodes. (10 Marks)

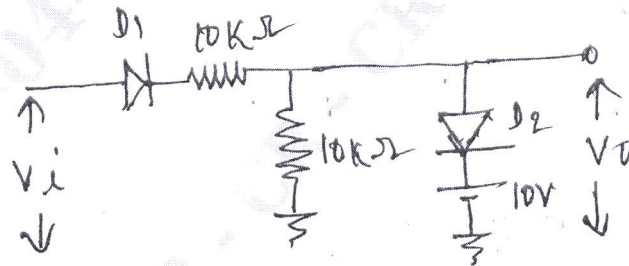


Fig. Q1 (b)  
OR

- 2 a. Using Ideal diode, design a suitable clamper circuit to perform the function as shown in Fig. Q2 (a). (08 Marks)

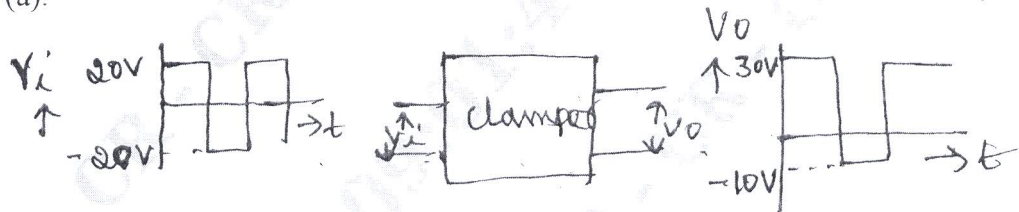


Fig. Q2 (a)

- b. With a neat circuit diagram, explain the working of Double Ended Clipper. (08 Marks)
- c. List the advantages of H parameters. (04 Marks)

**Module-2**

- 3 a. For the circuit shown in Fig Q3 (a), calculate voltage gain,  $Z_i$  and  $Z_o$ . (10 Marks)

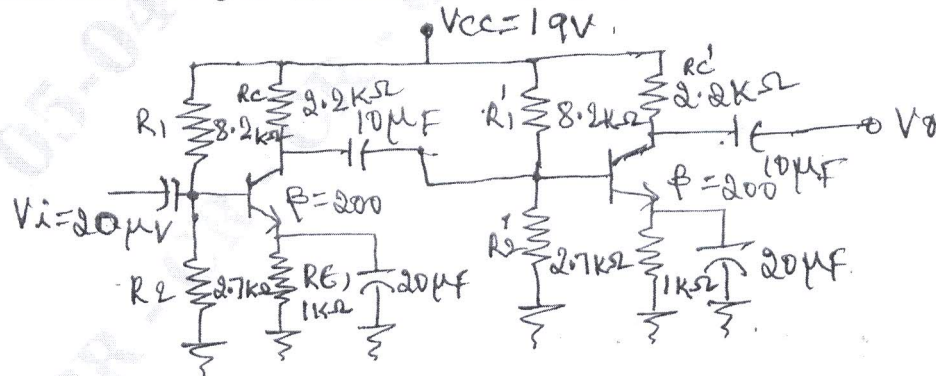


Fig. Q3 (a)

- b. Derive the expression for I/P resistance and O/P resistance of current series feedback amplifier. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. For the amplifier circuit shown in Fig. Q4 (a). Calculate  $Z_i$ ,  $Z_o$ ,  $A_i$  and  $A_v$ . (08 Marks)

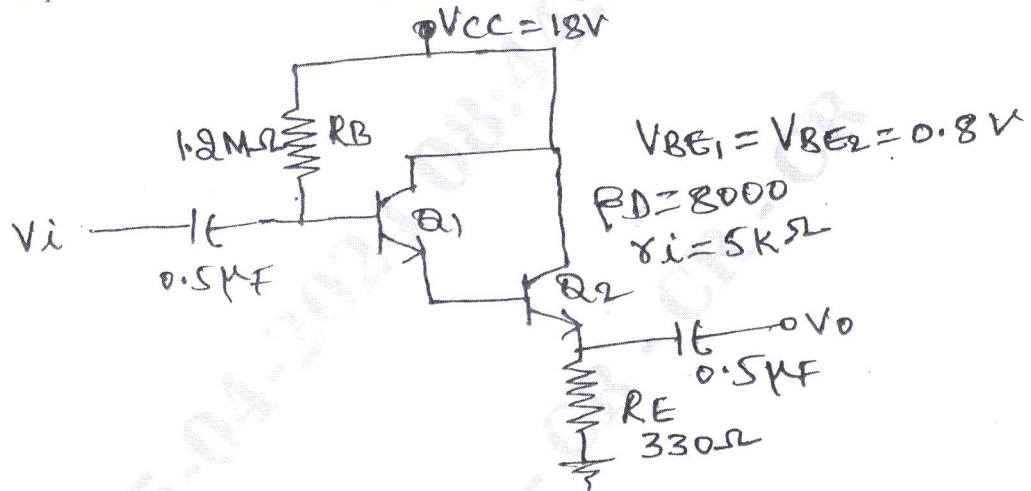


Fig. Q4 (a)

- b. Derive an expression for I/P impedance, O/P impedance, current gain and voltage gain of Darlington emitter follower. (12 Marks)

**Module-3**

- 5 a. Draw the circuit of class-B pushpull amplifier and derive an expression for its conversion efficiency. (08 Marks)
- b. Explain the basic operation and construction of n-channel depletion type MOSFET. (08 Marks)
- c. State the advantages and disadvantages of transformer coupled class A power amplifier. (04 Marks)

OR

- 6 a. Compare Class A, Class B, Class AB and Class C amplifiers with respect to Q point, efficiency and collector current flow. (06 Marks)
- b. Explain the construction and working of N channel JFET. (08 Marks)
- c. A single transistor amplifier with transformer coupled load produces harmonic amplitudes. In the output as  $B_0 = 1.5$  mA,  $B_1 = 120$  mA,  $B_2 = 10$  mA,  $B_3 = 4$  mA,  $B_4 = 2$  mA,  $B_5 = 1$  mA. Determine the percentage total harmonic distortion. (06 Marks)

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**Module-4**

- 7 a. With a neat circuit diagram, explain the working of instrumentation amplifier and also derive an expression for its O/P voltage. (10 Marks)
- b. What are active filters? With a neat circuit diagram, explain the working of 2<sup>nd</sup> order active High Pass filter. (10 Marks)

OR

- 8 a. For the non-inverting opamp shown in Fig. Q8 (a), find the O/P voltage. (08 Marks)

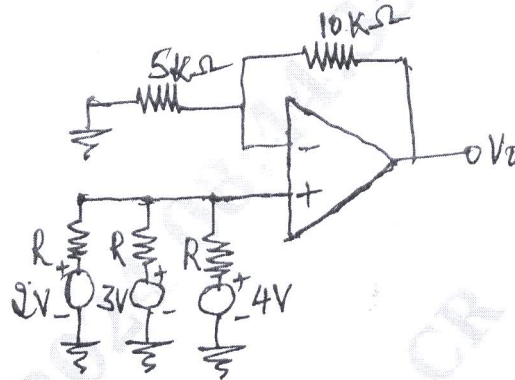


Fig. Q8 (a)

- b. Explain voltage follower regulator using opamp. (06 Marks)  
 c. List the advantages of active filters. (06 Marks)

### Module-5

- 9 a. State Barkhausen criteria and explain how it is fulfilled in RC phase shift oscillator and explain its operation. (08 Marks)  
 b. With a neat diagram, explain how opamp can be used as an integrator. (06 Marks)  
 c. Explain the operation of inverting zero crossing detectors. (06 Marks)

OR

- 10 a. Explain voltage to current converter with floating and grounded load. (10 Marks)  
 b. Draw the circuit of triangular/rectangular waveform generator with adjustable duty cycle and frequency and also explain its design steps. (10 Marks)

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