

Time: 3 hours

Max. Marks: 80

**Instructions:**

- Question No. 1 is compulsory
- Solve any 3 questions from the remaining 5
- Figures to the right indicate full marks
- Assume suitable data if necessary and mention the same in the answer sheet

<b>Q1. Attempt any 4</b>	<b>Marks</b>
a) List the ideal characteristics of Operational amplifier and give the practical values of Op-Amp IC 741.	5
b) Draw a neat circuit diagram for voltage to current converter with grounded load. Derive its output current expression.	5
c) Differentiate between Inverting and Non-Inverting Comparator.	5
d) Explain the functional block diagram of Timer IC 555.	5
e) With the help of a functional block diagram explain the working of a Three terminal fixed voltage regulator.	5
f) Draw the block diagram of Voltage Controlled Oscillator and explain its working.	5
<b>Q2a)</b> Draw a neat circuit of an instrumentation amplifier using 3-Op-Amps & derive its output equation.	10
<b>Q2b)</b> What are the limitations of an ideal differentiator using op-amp? Draw the circuit diagram of a practical differentiator and explain how it overcomes the limitations.	10
<b>Q3a)</b> With help of neat circuit diagram and voltage transfer characteristics explain the working of a non-inverting Schmitt trigger.	10
<b>Q3b)</b> Design an astable multivibrator having an output frequency of 1 kHz with a duty cycle of 50% using IC 555. Assume $C = 0.01\mu\text{F}$ .	10
<b>Q4a)</b> Design a voltage regulator using 723 to deliver an output voltage of 15 V and load current up to 50 mA.	10
<b>Q4b)</b> Draw the functional block diagram of IC 565 and explain its application as FSK demodulator.	10
<b>Q5a)</b> Draw a neat circuit diagram of an inverting summing amplifier using op-amp to obtain the expression for its output voltage as $V_O = -(V_1 + V_2 + V_3)$ , where $V_1, V_2, V_3$ are input voltages.	10
<b>Q5b)</b> With the help of a neat diagram explain the working of Wein bridge oscillator using op amp. Derive the expression for its frequency of oscillation. What are the values of R & C if its frequency of oscillation is 5 kHz?	10
<b>Q6a)</b> With the help of a neat diagram and wave forms at appropriate points in the circuit explain the working of square and triangular waveform generator using op amps.	10
<b>Q6b)</b> What is Pulse Width Modulation? With the help of a neat circuit diagram and waveforms at trigger input, control voltage pin, across the timing capacitor and at the output, explain the working of IC 555 as Pulse Width Modulator.	10

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