CBCS SCHEME

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17EE46

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw the block diagram of an op-amp and explain. **(10 Marks)**

b. Sketch the 3-input non-inverting summing amplifier circuit. Explain the operation of the circuit and derive an equation for the output voltage. Also explain how to convert it to an adder and averaging amplifier. **(10 Marks)**

OR

2 a. List the ideal characteristics of an op-amp (any six). **(06 Marks)**

b. Mention the advantages of using negative feedback in op-amps (any 4). **(04 Marks)**

c. What is an instrumentation amplifier? Obtain an expression for output voltage V_0, in terms of change in resistance ΔR of an instrumentation amplifier using transducer bridge. **(10 Marks)**

Module-2

3 a. With a neat circuit diagram, explain the working of 1st order low pass filter and draw its typical frequency response curve. **(10 Marks)**

b. Design a set adjustable positive voltage regulator using IC LM317 for the output voltage of 5 V. **(04 Marks)**

c. Mention the advantages of active filter over passive filters. (any six) **(06 Marks)**

OR

4 a. Draw the circuit of a adjustable voltage regulator and explain its operation. **(10 Marks)**

b. Design a second order low pass filter for a cut-off frequency of 1 kHz. Also draw the circuit diagram and mention the component values. **(06 Marks)**

c. Design a narrow band pass filter for the following specifications, centre frequency 1.5 kHz, Q-factor is 7, gain at f_C is 15. **(04 Marks)**

Module-3

5 a. With a neat circuit diagram, explain the working of triangular / rectangular wave generator. **(10 Marks)**

b. With a neat circuit diagram and waveform explain the working of inverting Zero Cross over Detector (ZCD). **(10 Marks)**

OR

6 a. With a neat circuit diagram and necessary derivation for load current, explain voltage to current converter with grounded load. **(10 Marks)**

b. Design a RC-phase shift oscillator using op-amp for a frequency of 500 Hz. Also draw the circuit diagram and name the component values take C = 0.1 μF **(06 Marks)**

c. Define the working principle of voltage to frequency (V/F) converter and mention its applications (any 4). **(04 Marks)**

Module-4

7 a. With a neat circuit diagram and waveform explain the working of precision Full Wave rectifier. **(10 Marks)**

b. With a neat circuit diagram, explain the working of successive approximation type ADC. **(10 Marks)**

OR

8 a. Explain the operation of R-2R ladder digital to analog converter circuit. **(10 Marks)**

b. Design a non-saturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input with a 0.5 V peak value. Use Bi-polar op-amp with a supply voltage of $\pm 15V$. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain phase locked loop in detail. **(10 Marks)**

b. Draw the pin diagram of 555IC timer and mention its pin functions. **(05 Marks)**

c. Design a monostable multivibrator using IC 555 timer to obtain a pulse width of 10 msec. **(05 Marks)**

OR

10 a. With a neat diagram, explain the internal architecture of IC555 timer. **(10 Marks)**

b. Define the following terms related to PLL:

(i) Lock range.
(ii) Capture range.
(iii) Pull in time
(iv) Tracking range. **(08 Marks)**

c. Mention the applications of IC555 timer (any 4). **(02 Marks)**

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