18/11/2024

TE/EIX/sem-V/CBCGS/R-19/e-scheme/LIC/SH-24

Time :- 3 Hours **Max. Marks : 80**

QP-10067025

(i) Question No. 1 is compulsory
(ii) Attempt any three (03) out of remaining five (05) questions
(iii) Assume suitable data if required
(iv) Figures to the right indicate full marks

Q.1 Attempt any four :- **20**

(a) How can output offset voltage (V_{oo}) be compensated in op-amp ?
(b) Explain the virtual ground & virtual short concept in the op-amp.
(c) Differentiate between active & passive filters.
(d) Describe operation of current to voltage (I to V) converter with neat circuit diagram.
(e) State the various features of timer IC 555.

Q.2 (a) Draw the internal block diagram of an operational amplifier (op-amp) & explain function of each individual stage in detail. **20**
(b) Draw circuit diagram for an op-amp amplifier in non-inverting configuration & derive the mathematical expression for closed loop voltage gain (A_v).

Q.3 (a) Design a 2nd order low pass filter (LPF) for a cut-off frequency f_o = 2 kHz with Q = 5 & draw neat labeled diagram for the same using standard component values. **20**
(b) Derive the output voltage (V_o) expression for a three op-amp instrumentation amplifier & mention it's various advantages.

Q.4 (a) Design an op-amp based inverting Schmitt Trigger for symmetrical operation where both upper & lower threshold voltage levels are ± 2.5 V. Assume V_{sat} = ± 12 V for the circuit. **20**
(b) Explain the operation of timer IC 555 as astable multivibrator with neat diagram & appropriate waveforms, Derive the relevant expressions.

Q.5 (a) Design a voltage regulator using IC LM 723 for V_o = + 5 V, I_o = 25 mA, I_{sc} = 50 mA & V_{sense} = 0.65 V. Draw the neat labeled diagram using standard component values. **20**
(b) Design op-amp based practical integrator circuit with DC gain of 10 to integrate an input signal of 20 kHz. Draw neat labeled diagram using standard component values.

Q.6 Write short notes (any two) :- **20**

(a) Window Detector
(b) Wien Bridge Oscillator
(c) Monostable Multivibrator using IC 555
