

# 17445

**11718**

**3 Hours / 100 Marks**

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. a) Attempt any SIX of the following:**

**12**

- (i) State ideal and typical values of
  - 1) slew rate
  - 2) CMRR
- (ii) State the need of signal conditioning (two points)
- (iii) List specification of IC LM 324.
- (iv) Draw circuit diagram of basic differentiator using OP-AMP.
- (v) Draw input and output waveform for active integrator for square wave input.
- (vi) Define the following wr. to filter:
  - 1) Q factor
  - 2) roll off rate

P.T.O.

(vii) State the applications of PLL.

(viii) Define:

- 1) Output voltage swing
- 2) SVRR

b) **Attempt any TWO of the following:** **8**

- (i) Draw block diagram of op-amp and describe the functions of constant current source and output stage.
- (ii) Draw ideal and practical voltage transfer characteristics of op-amp.
- (iii) Draw dual input unbalanced output differential amplifier and state ideal characteristics of op-amp.

2. **Attempt any FOUR of the following:** **16**

- a) Describe virtual ground and virtual short concept with reference to op-amp.
- b) Draw closed loop inverting amplifier using op-amp and derive expression for its gain.
- c) Draw the circuit diagram and output waveform for sine and square wave input for output voltage.

$$V_0 = -\frac{1}{RC} \int_0^t V_{in} dt + C$$

- d) Using OP-AMP, draw the circuit of show the output  $V_0 = 5(V_1 - 4V_2)$  where  $V_1$  and  $V_2$  are input voltages.
- e) If  $R_1 = 3 \text{ k}\Omega$ ,  $R_F = 120 \text{ k}\Omega$ ,  $V_{CC} = \pm 15 \text{ V}$  and rms input voltage  $V_i = 50 \text{ mV}$ . Calculate output voltage in inverting and non-inverting Amplifier of op-amp.
- f) Draw and explain Basic Integrator using op-amp.

**3. Attempt any FOUR of the following:****16**

- a) Draw the circuit diagram of instrumentation amplifier with transducer bridge and describe the operation of it to obtain output voltage.
- b) Draw and explain the circuit of V to I converter with floating load.
- c) Draw and describe following op-amp based operation using log and antilog amplifier.  $V_0 = V_1 \times V_2$
- d) Explain working of active negative peak detector with neat circuit and waveforms.
- e) Describe the operation of ZCD with neat circuit diagram and waveforms.
- f) Draw circuit diagram and input output waveforms of op-amp based Schmitt trigger.

**4. Attempt any FOUR of the following:****16**

- a) Describe the operation of non-inverting comparator using op-amp with waveforms.
- b) Design a first order low pass filter with  $10 \text{ kHz}$  cut off frequency and pass band gain 2.
- c) State two merits and two demerits of active filters.
- d) Classify filters based on
  - (i) Frequency response
  - (ii) Components used
  - (iii) Frequency range
  - (iv) Nature of pass band and stop band.
- e) Draw the second order high pass filter and describe its operation.
- f) Draw and explain the circuit of notch (narrow band reject) filter.

**5. Attempt any FOUR of the following:****16**

- a) Draw the functional block diagram of Timer IC 555 and explain each block.
- b) Draw block diagram and transfer characteristics of PLL.
- c) Draw and explain the working of FM demodulator using PLL.
- d) Describe the operation of phase detector and role of VCO in PLL.
- e) Design an Astable multivibrator using IC 555 timer for a frequency of 2 KHz.
- f) Describe the application of IC 555 as touch plate switch with circuit diagram.

**6. Attempt any FOUR of the following:****16**

- a) Draw a neat circuit diagram of VCO using IC 555 and explain its working.
  - b) Draw and explain the working of phase shift oscillator using IC 741.
  - c) Draw the circuit diagram of bistable multivibrator using op-amp and describe its working.
  - d) Design op-amp based Wein Bridge Oscillator for frequency of 1 KHz.
  - e) Draw the circuit of astable multivibrator using IC 555 and describe its working.
  - f) Draw circuit diagram of Schmitt trigger using IC 555.
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