

17445

15162

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) Assume suitable data, if necessary.
 - (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) Define:
 - 1) input bias current
 - 2) input offset current
- (ii) Draw ideal voltage transfer curve of an op-amp.
- (iii) List any four specifications of ICLM 324.
- (iv) Draw the circuit diagram of positive peak detector.
- (v) Draw voltage to current converter with grounded load.
- (vi) Define:
 - 1) roll-off rate
 - 2) order of filter
- (vii) Draw circuit of notch filter.
- (viii) State functions of following pins of IC555
 - 1) Threshold
 - 2) Discharge

P.T.O.

- b) **Attempt any TWO of the following:** **8**
- (i) What is the use of level shifter stage? Draw its circuit diagram.
 - (ii) State ideal values of following parameters of op-amp as well as state typical values of following parameters of op-amp IC741.
 - (iii) Draw and explain ideal voltage transfer curve of op-amp.
2. **Attempt any FOUR of the following:** **16**
- a) Compare open loop and closed loop configuration of op-amp on following basis.
 - (i) Circuit diagram
 - (ii) Gain
 - (iii) Bandwidth
 - (iv) Application
 - b) With neat sketch derive the expression for output voltage of non-inverting averaging amplifier.
 - c) With neat diagram explain the concept of frequency compensation and offset nulling.
 - d) Draw neat diagram of active integrator and obtain expression for output voltage.
 - e) Determine the output voltage for an open-loop differential amplifier with $V_1=1.2$ Vdc and $V_2=1$ Vdc. Assume op-amp as $\mu A741$.
 - f) Construct and draw the circuit to get the output voltage $V_0=3V_1+2V_2$ where V_1 and V_2 are input voltages.
3. **Attempt any FOUR of the following:** **16**
- a) Draw and explain sample and hold circuit using op-amp.
 - b) Compare between comparator and schmitt trigger (any four points)
 - c) State the needs of peak to peak detector and draw its circuit diagram.
 - d) State need of signal conditioning and signal processing. List any four applications of instrumentation amplifier.

- e) Draw circuit diagram and input and output waveforms of inverting ZCD and non-inverting ZCD (zero crossing detector)
- f) Draw and explain voltage to current converter with floating load. List its four applications.

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

16

- a) Design and draw low pass filter with cut off frequency 2kHz and passband gain of 2.
- b) Design a first order low-pass butterworth filter with a passband gain of 2 and cut-off frequency of 2kHz. Draw the designed circuit.
- c) Suggest and draw op-amp based circuit using butterworth filter to fulfill following response (Refer Figure No.1)

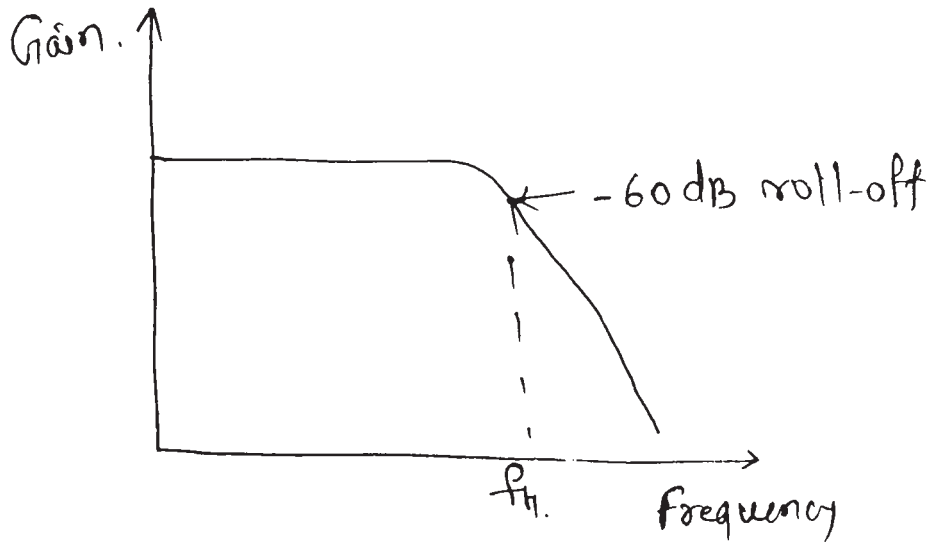


Fig. No. 1

- d) Describe the operation of wide bandpass filter with the help of circuit diagram.
- e) Draw only circuit of notch filter and write formula for notch frequency f_N .
- f) Classify the filters on following basis:
- Components used
 - Frequency range
 - Frequency response
 - Nature of passband and stopband

- 5. Attempt any FOUR of the following:** **16**
- a) Describe the operation of phase detector and role of VCO in PLL.
 - b) Draw and describe the operation of water level controller using IC555.
 - c) Explain the use of PLL in FM detection.
 - d) Draw the pin diagram of IC555 and explain the function of various pins.
 - e) Explain how monostable multivibrator can be used as frequency divider.
 - f) Draw the transfer characteristics of PLL and explain.
- 6. Attempt any FOUR of the following:** **16**
- a) Draw the circuit diagram of square wave generator using IC555. State the purpose of external diode used in the circuit and state expression of its output frequency.
 - b) Draw the circuit diagram of phase shift oscillator using IC741 state any two applications of it.
 - c) Draw and describe the operation of astable multivibrator using op-amp.
 - d) Design and draw Op-Amp based Wein Bridge Oscillator for frequency 1kHz.
 - e) Explain the working of IC555 as a voltage controlled oscillator (VCO).
 - f) Explain the working of IC555 as Schmitt trigger. Draw the circuit diagram and sketch the output waveforms.
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