

Analog Electronics (313324)

MSBTE Diploma · K-Scheme · Model Question Paper — Set B

Time: 3 Hours**Max. Marks: 70****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 the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) Define the following terms related to amplifiers: i) Gain ii) Distortion
- b) State any two advantages of negative feedback.
- c) Compare amplifier and oscillator. (Any two points)
- d) Draw the labelled pin diagram of op-amp IC 741.
- e) State ideal and practical values of the following parameters of IC 741: i) Input resistance ii) Output resistance
- f) Define: i) Order of a filter ii) Centre frequency
- g) State the function of the following pins of IC 555: i) Threshold ii) Discharge

Q.2 Attempt any THREE of the following:**12**

- a) Explain the working of single stage directly coupled class A power amplifier with the help of circuit diagram and waveforms.
- b) Name the op-amp configuration in which virtual ground exists. Explain the virtual ground concept with a suitable diagram.
- c) Design an RC phase shift oscillator using IC 741 to produce a sinusoidal output at $f_o = 800$ Hz. Draw the designed circuit. (Assume $C = 0.01 \mu\text{F}$)
- d) Compare class A, class B, class AB and class C power amplifiers on the basis of: i) Efficiency ii) Power dissipation in transistor iii) Conduction angle iv) Position of Q-point

Q.3 Attempt any THREE of the following:**12**

- a) Draw the circuit diagram of op-amp as a subtractor and derive the equation for its output voltage.
- b) List the types of feedback connections. Draw the diagram of voltage-series feedback.

- c) Define oscillator. Classify oscillators and state the Barkhausen criteria.
- d) For a first order Butterworth low pass filter $R = 15 \text{ k}\Omega$, $C = 0.01 \text{ }\mu\text{F}$, $R_1 = 10 \text{ k}\Omega$ and $R_F = 22 \text{ k}\Omega$. Calculate the cut-off frequency and pass band voltage gain.

Q.4 Attempt any THREE of the following:

12

- a) Draw the circuit of voltage to current converter with grounded load and derive the expression for load current.
- b) Compare integrator and differentiator. (Any four points)
- c) Differentiate between active and passive filters. (Any four points)
- d) Explain the use of PLL as a frequency multiplier with block diagram.
- e) Explain class C power amplifier with neat circuit diagram.

Q.5 Attempt any TWO of the following:

12

- a) Design an astable multivibrator using IC 555 for frequency 1 kHz and duty cycle 60 %. Draw the designed circuit and output waveform. (Assume $C = 0.1 \text{ }\mu\text{F}$)
- b) In an inverting Schmitt trigger $R_1 = 150 \text{ }\Omega$, $R_2 = 68 \text{ k}\Omega$, $V_{\text{sat}} = \pm 14 \text{ V}$ and $V_{\text{in}} = 1 \text{ V}_{\text{p-p}}$ sine wave. Explain its working and determine V_{UT} , V_{LT} and hysteresis voltage. Draw the hysteresis curve and output waveform.
- c) Describe the working principle of BJT based crystal oscillator with circuit diagram. Draw the equivalent circuit of crystal.

Q.6 Attempt any TWO of the following:

12

- a) Design a second order Butterworth low pass filter with higher cut-off frequency $f_H = 2 \text{ kHz}$. Draw the designed circuit and sketch its frequency response. (Assume $C = 0.01 \text{ }\mu\text{F}$)
- b) Explain the working of IC 555 as a voltage controlled oscillator (VCO) with circuit diagram and waveforms.
- c) Draw and explain the transformer coupled class B push-pull amplifier with input and output waveforms. State its efficiency.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in