



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Electronic Circuits	Course Code:ETC222005
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) Draw the output characteristics of an n-channel EMOSFET. Using the parameters $K = 0.2 \text{ mA/V}^2$ (6) CO1 and $V_{TN} = 1.2 \text{ V}$, calculate the drain current for the following gate-to-source voltages:
a) $V_{GS} = 2 \text{ V}$
b) $V_{GS} = 4 \text{ V}$.

Question No. 2

- 2a) Calculate the frequency generated by an RC phase-shift oscillator that uses 5 nF capacitors and 10 k Ω resistors in the feedback network. Also draw the circuit diagram of an RC phase-shift oscillator. (6) CO2

Question No. 3

- 3a) Define an instrumentation amplifier. State the essential requirements of a good instrumentation amplifier and list its common applications. Draw and explain the circuit diagram of an instrumentation amplifier (8) CO3

OR

- 3b) Explain the concept of hysteresis in a Schmitt trigger. For an inverting Schmitt trigger using IC 741, (8) CO3 determine the upper and lower threshold voltages (V_{ut} and V_{lt}). The circuit uses $R_1 = 100 \Omega$ and feedback resistor $R_2 = 56 \text{ k}\Omega$. A 1 V peak-to-peak sine wave is applied at the input. Draw the corresponding input-output waveforms.

- 3c) Design a square-wave generator to produce an output frequency of 3 kHz. The op-amp is powered by $\pm 15 \text{ V}$. Assume 0.01 μF value capacitor is being used. Draw final designed circuit diagram.. (8) CO3

OR

- 3d) Explain why an op-amp in open-loop mode is not suitable for linear applications. Design a circuit (8) CO3 that provides an output $V_o = -(5V_a + 2V_b + 3V_c)$ using a feedback resistor of 1 k Ω . Draw the final designed circuit.

Question No. 4

- 4a) Design a second-order Butterworth low-pass filter with a roll-off rate of -40 dB/decade to attenuate (8) CO4 frequencies above 2 kHz. Assume the capacitor value is 0.01 μF . Draw the final circuit diagram.

OR

- 4b) Design an active notch filter to suppress a 70 Hz signal using a $0.47 \mu\text{F}$ capacitor. Draw the complete circuit and sketch the frequency response of the notch filter. (8) CO4
- 4c) Compare low-pass and high-pass filters using their frequency responses. State their applications and draw the first-order circuit diagrams for both filters. (8) CO4

OR

- 4d) Explain the following terms: (8) CO4
- 1) Active filters
 - 2) Pass band
 - 3) Stop band
 - 4) Attenuation

Question No. 5

- 5a) Define the following parameters: 1) Load regulation 2) Line regulation. Elaborate the operation of linear regulated power supply with the help of block diagram. (8) CO5

OR

- 5b) Explain phase-locked loop with the help of block diagram. What do you mean by lock range and capture range? (8) CO5
- 5c) Compare different types of Digital to analog convertors. What is the largest value of output voltage from an 8-bit DAC that produces 1.0V for a digital input of 10110010? (8) CO5

OR

- 5d) State the applications and key specifications of the IC LM317. If the LM317 regulator uses $R_1 = 240 \Omega$ and a $5.6 \text{ k}\Omega$ potentiometer as R_2 , determine the adjustable output voltage range. (8) CO5

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