# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## February 2025 Semester End Main Examinations

**Programme: B.E.**      **Semester: IV**
**Branch: Electronics and Communication Engineering**      **Duration: 3 hrs.**
**Course Code: 23EC4PCAIC**      **Max Marks: 100**
**Course:  Analog Integrated Circuits**

**Instructions**:  1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

| | | | UNIT – I | CO | PO | Marks |
|---|---|---|---|---|---|---|
| 1 | a) | | List the ideal characteristics of an operational amplifier and mention its practical values of each. | CO 1 | - | **06** |
| | b) | | Sketch the circuit of a non-saturating Half wave precision rectifier. Draw the input and output waveforms and explain the circuit operation. | CO 1 | PO2 | **08** |
| | c) | | Design an inverting amplifier using op-amp 741 with voltage gain 100 and voltage required is 5V. | CO 4 | PO3 | **06** |
| | | | **OR** | | | |
| 2 | a) | | Define the following parameters of op-amps specifying their ideal and typical practical values (i) PSRR  (ii)  CMRR  (iii) Slew Rate | CO 1 | - | **06** |
| | b) | | Derive an expression for the gain of an instrumentation Amplifier. | CO2 | PO1 | **08** |
| | c) | | Draw an op-amp Sample and hold circuit. Sketch the signal, control and output voltage waveforms and explain the operation of the circuit. | CO 1 | - | **06** |
| | | | **UNIT – II** | | | |
| 3 | a) | | Draw the circuit diagram of inverting Schmitt trigger with different UTP and LTP adjustments. Sketch I/O transfer curve, waveform and operation. | CO 1 | PO2 | **10** |
| | b) | | Using 741 op-amp with supply of ±12v, design a RC phase shift oscillator to have an output frequency of oscillation 5KHz. Choose $I_1$=50μA. | CO 2 | PO2 | **10** |
| | | | **OR** | | | |
| 4 | a) | | Show that the gain of the Wien bridge oscillator is equal to 3 with necessary diagram and equations | CO 1 | PO2 | **10** |
| | b) | | Identify the circuit with a pulse width of T=0.693RC and derive the same. Also illustrate it's working with neat circuit diagram and waveforms. | CO 2 | PO2 | **10** |

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | | UNIT - III | | | |
|---|---|---|---|---|---|---|
| 5 | a) | | List the performance parameters of power supply and explain. | *CO* 1 | | **06** |
| | b) | | With necessary functional block diagram of 3-terminal IC voltage regulator explain its operation. | *CO* 3 | *PO2* | **08** |
| | c) | | Draw the circuit of the low pass filter with variable gain and derive its transfer function. | *CO* 3 | *PO2* | **06** |
| | | | **OR** | | | |
| 6 | a) | | From fundamentals derive an expression for cut off frequency of a $2^{nd}$ order butterworth low pass filter with Sallen-key filter type with unity gain | *CO* 3 | *PO2* | **10** |
| | b) | | Analyze the working of a low voltage regulator circuit utilizing the IC-723. Also Design the circuit for the output voltage of 5V. Assume $V_{ref}$ = 7V. | *CO 3* | *PO2* | **10** |
| | | | **UNIT – IV** | | | |
| 7 | a) | | Write and explain with neat diagram of Digital to Analog converter with R-2R resistors. | *CO* 3 | *PO1* | **10** |
| | b) | | A 4-bit Binary (Binary –weighted) digit convertor the binary inputs $b_0$ to $b_3$ with +5V and R=10KΩ and feedback resistance of $R_F$=1KΩ,Find output voltage and circuit diagram for the following cases<br>i) when switch $b_0$ is closed<br>ii) when switch $b_1$ is closed<br>iii) when switch $b_0$ and $b_1$ is closed | *CO* 3 | *PO3* | **10** |
| | | | **OR** | | | |
| 8 | a) | | List the specifications of ADC and explain any three in detail. | *CO1* | **-** | **06** |
| | b) | | Describe the operation of counter type ADC. | *CO* 3 | *PO2* | **06** |
| | c) | | How many clock pulses are required for 8-bit Successive-approximation A/D converter, explain its operation with neat diagram. | *CO* 3 | *PO2* | **08** |
| | | | **UNIT – V** | | | |
| 9 | a) | | Explain the functional block diagram of IC555 | *CO* 1 | - | **08** |
| | b) | | Design a monostable 555 timer circuit to produce an output pulse of 10sec wide. Draw the circuit diagram. | *CO* 4 | *PO3* | **04** |
| | c) | | Draw the block diagram of PLL and explain its operation, list the application of PLL | *CO* 1 | *PO2* | **08** |
| | | | **OR** | | | |
| 10 | a) | | Design a 555 Astable Multivibrator to operate at 5KHz with a duty cycle of 40%. Assume C=0.01μF. | *CO* 4 | *PO3* | **10** |
| | b) | | Derive an expression for pulse width of a Monostable multivibrator and draw the corresponding functional block diagram using 555 timer IC. | *CO* 1 | *PO2* | **10** |

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