



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; May - 2022

Basic Electronics

(Common to all Branches)

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Apply knowledge of physics and mathematics to understand operation of PN diodes, Zener diodes MOSFET, solar cells, LCD, CRT, Transducers, modulation techniques and Opamps.

CO2: Analyze circuits built with diodes, Zener diodes, MOSFET and Opamp.

CO3: Design simple circuit to perform rectification, voltage regulation, Opamp based amplifier, summer and filter, MOSFET based amplifier, digital circuit.

CO4: Analyze and implement basic Digital Electronic circuits for a given application using knowledge of Boolean Algebra and Basic gates.

CO5: Discuss different modulation techniques and communication systems.

Note: I) PART - A is compulsory. Two marks for each question.

II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A					
10					
I a.	Design an appropriate circuit to obtain the desired waveform from the given input signal Fig. Q(1.1).	2	L3	CO3	PO2
b.	Draw the circuit diagram for a voltage divider configuration of MOSFET.	2	L2	CO1	PO1
c.	Find V_0 in the circuit shown in Fig. Q.(1.3). Let $R_f = 10\text{ k}\Omega$, $R_1 = 2\text{ k}\Omega$ and $R_2 = 5\text{ k}\Omega$.	2	L2	CO2	PO2
d.	Realize XOR gate using 4 NAND gates.	2	L2	CO2	PO2
e.	The total power content of an AM signal is 1000 W. Determine the power being transmitted at carrier frequency and at each side bands when modulation is 100%.	2	L2	CO2	PO2

II : PART - B		90		
UNIT - I		18		
1 a.	Sketch and explain the forward and reverse V-I characteristics of a germanium diode. A silicon diode and germanium diodes are connected in series with a diode forward resistance of 0.1Ω and 0.56Ω for silicon and germanium diodes respectively. For a DC supply of 25 V, determine the forward current through the diodes.	9	L2	CO2 PO2
b.	With the help of a neat diagram, explain the working of full wave bridge rectifier. Also write the expressions for I_{dc} and I_{rms} .	9	L2	CO2 PO2
c.	Sketch and explain the reverse V-I characteristics of a Zener diode. A Zener of $V_Z = 6 \text{ V}$ is used with a DC supply of 15V in a loaded Zener voltage regulator. The resistance in series with input is 200Ω . Zener has $I_{Zmin} = 10 \text{ mA}$ and $P_{Zmax} = 0.5 \text{ W}$. Calculate the minimum value of load resistance.	9	L2	CO2 PO2
UNIT - II		18		
2 a.	Discuss the construction and characteristics of n-channel depletion type MOSFET with relevant diagrams.	9	L2	CO2 PO2
b.	Draw the symbol of enhancement type NMOSFET clearly showing the terminals of it. Explain the construction and working of it. Also draw its drain characteristics marking various regions of operation.	9	L2	CO2 PO2
c.	With the help of a neat circuit diagram, explain FET phase shift oscillator and hence get the expression for the frequency of oscillation.	9	L2	CO2 PO2
UNIT - III		18		
3 a.	Explain how opamp can be used as a 3-inut inverting adder. Also write the expression for its output voltage. Hence design a circuit to obtain the following output voltage; $V_0 = -[0.5 V_1 + 0.8 V_2 + 2 V_3]$. Assume $R_f = 10 \text{ k}\Omega$.	9	L2	CO3 PO3
b.	Draw the circuit of an inverting opamp integrator and write the expression for output voltage. Explain its working with neat waveforms considering the input to be square waveform.	9	L2	CO2 PO2
c.	(i) In an opamp, when $V_1 = 0.5 \text{ mV}$, $V_2 = -0.5 \text{ mV}$, the output is 8 V when $V_1 = V_2 = 1 \text{ mV}$, the output is 12 mV. Calculate its CMRR in dB. The voltage V_1 is non-inverting and V_2 is inverting input.	6	L2	CO3 PO3
	(ii) An inverting opamp amplifier has an input of -1 V and power supply is $\pm 12 \text{ V}$. If the feedback resistor $R_f = 20 \text{ k}\Omega$ what value of input resistor is required to get an output of 5 V?	3	L3	CO3 PO3

UNIT - IV**18**

- 4 a. (i) If $F = \overline{AB} + \overline{C} + \overline{D} + \overline{E}$. Find the expression for \overline{F} . 3
- (ii) Simplify the following expression and realize the same using NAND gates: $Z = \overline{ABC} + B + \overline{BD} + \overline{ABD} + \overline{AC}$ 6
- b. Write the circuit diagram for full adder using two half adder. Explain with truth table. Also write the equation for sum and carry. 9 L2 CO4 PO2
- c. (i) $(9275)_{10} = (?)_{16}$ 4
 $(11001.011)_2 = (?)_{10}$ 4 L2 CO4 PO2
- (ii) Subtract $(24)_{10}$ from $(17)_{10}$ using 2's complement method and express the binary result in decimal. 5

UNIT - V**18**

- 5 a. With the help of a neat diagram, explain amplitude modulation in detail. 9 L2 CO5 PO3
- b. What is digital communication? Explain the advantages of digital communication over analog communication. 9 L2 CO5 PO3
- c. Explain how a call is made from a mobile phone to another mobile phone. 9 L2 CO4 PO2

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