



**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY UNA
HIMACHAL PRADESH**

An Institute of National Importance under MoE

Saloh, Una- 177 209

Website: www.iitu.ac.in

AY 2023-24

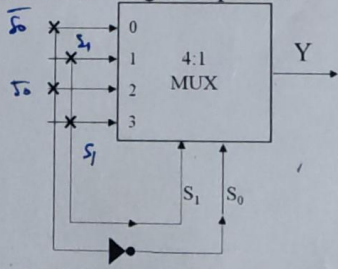
School of Electronics

CURRICULUM: IITUGECE22

Cycle Test - II

November 20, 2023, 02:00 PM-03:00 PM

Degree	B. Tech.	Branch	ECE
Semester	III		
Subject Code & Name	ECC302: Digital Circuits and Systems		
Time: 60 Minutes	Answer All Questions	Maximum: 20 Marks	

S. No.	Question	Marks
1.a	What is the difference between a Combinational circuit and Sequential Circuit, and give two examples for each.	1
1.b	Design a circuit that would accept two numbers, $A = (07)_{10}$ and $B = (05)_{10}$, and provide the output as per the following conditions: i) $A+B$ as the output if the control bit $C = 1$, and ii) $A-B$ as the output if the control bit $C = 0$.	2
1.c	Implement 2-bit magnitude comparator circuit of 'n' variables using the multiplexers of 'n-1' variables by making MSB as the input.	2
2.a	Implement Full adder circuit using Half adders and basic gates.	1
2.b	Identify the combinational device from the description given below and draw the block diagram of the device: i) The device that is used to convert the serial data to parallel data. ii) The device that is used to identify the active line and give the binary representation of the line as the output.	2
2.c	Implement 32:1 MUX using only 4:1 MUX(s) and label the circuit.	2
3.a	Write the truth table for the following multiplexer. 	1
3.b	Design a circuit that accepts three bit number as the input and provide the complement of the number in excess-3 format.	2

3.c	<p>Write the truth table for the following circuit by taking A, B and C as input combinations, and, Y_1 and Y_2 as output pins.</p>	2
4.a	Draw the circuit of SR latch with enable and write the truth table.	1
4.b	What is race around condition in JK-Flip-flop and explain how Master-Slave configuration addresses the issue.	2
4.c	<p>Consider the 4-bit register shown in the Fig. 1. If the initial value in the register is Enable = 0, $Q_3 = 1$, $Q_2 = 0$, $Q_1 = 0$, and, $Q_0 = 0$ (read as 1000). Mention the steps to replace the data with 0011 as the next state and write the characteristic tables for the same.</p> <p style="text-align: center;">Fig. 1: 4-bit register</p>	2

***** GOOD LUCK *****

Q_n Q_{n+1}



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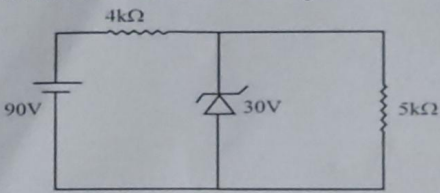
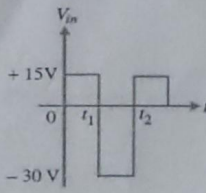
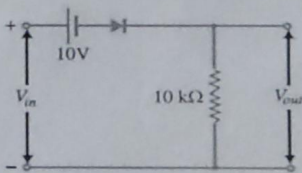
School of Electronics

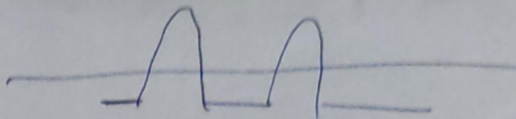
CURRICULUM: IIITUGECE22

Cycle Test – II

20 Nov.'2023 (9:00 AM – 10:00 AM)

Degree	B. Tech.	Branch	ECE
Semester	III		
Subject Code & Name	ECC301: ELECTRONIC DEVICES AND CIRCUITS		
Time: 60 Minutes	Answer All Questions	Maximum: 20 Marks	

Sr. No.	Question	Marks
1.a	What are the applications of Clipper and Clamper circuits?	(1)
1.b	What is rectification? Explain the working of bridge full-wave rectifier with relevant circuit diagrams and waveforms.	(2)
1.c	Explain the process of finding hybrid parameters of a transistor in CB configuration.	(2)
2.a	Find the diode current for the circuit shown in Fig. 1. <div style="text-align: center;">  <p>Fig. 1</p> </div>	(1)
2.b	For the input waveform to the circuit shown in Fig. 2, find the output waveform. Assume ideal diode. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p>Fig. 2</p> </div> </div>	(2)



2.c a	For the input waveform to the circuit shown in Fig. 3, find the output waveform. Assume Si diode.	(2)
	<p style="text-align: center;">Fig. 3</p>	
3.a	What is the Early effect? Explain how it affects the BJT characteristics in CB configuration.	(1)
3.b	Determine the range of values of V_i in Fig. 4 that will maintain the diode in the ON state.	(2)
	<p style="text-align: center;">Fig. 4</p>	
3.c	Explain the input and output characteristics of NPN transistor in CE configuration with neat diagram.	(2)
4.a	A transistor has $I_E = 11$ mA and $\alpha = 0.98$. Determine the values of I_C and I_B .	(1)
4.b	A transistor operating in CB configuration has $I_C = 2.98$ mA, $I_E = 3.2$ mA, and $I_{CO} = 0.02$ mA. What current will flow in the collector circuit of this transistor when connected in CE configuration with $I_B = 30$ μ A?	(2)
4.c	Explain the thermal runaway and stability factor in a transistor.	(2)

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Cycle Test – II

21, November'23

Degree	B. Tech.	Branch	ECE
Semester	III		
Subject Code & Name	ECC304: Communication Systems		
Time: 60 Minutes	Answer All Questions	Maximum: 20 Marks	

Sl. No.	Question	Marks
1.a	Name and state the rule for limiting the bandwidth of Wideband Frequency Modulation.	(1)
1.b	A carrier signal is Frequency Modulated using a message signal with amplitude A_m and frequency f_m . It is given that the strength of carrier frequency component in the spectrum is 0 for increasing A_m from 0V. Find the value of k_f for $A_m = 2$ Volts and $f_m = 1$ KHz.	(2)
1.c	Prove that the bandwidth of Wideband Frequency Modulation is infinite using mathematical equations and diagrams.	(2)
2.a	Draw the block diagram for the generation of Frequency Modulation using only Phase modulator.	(1)
2.b	A carrier signal of frequency f_c is given to both AM and FM transmitter for the message signal of frequency f_m . Find the relationship between μ and β such that strength of frequency component $f_c + f_m$ is same in both the cases of AM and FM.	(2)
2.c	Find the value of frequency and phase deviation for the following signal: $S(t) = \cos 2\pi(2 \times 10^6 t + 20 \sin 100t + 70 \cos 20t)$	(2)
3.a	Derive the relationship between Bandwidth and Quality factor using Gain-Frequency characteristics of a Tuned amplifier.	(1)
3.b	Explain the need of Pre-emphasis and De-emphasis circuit in AM.	(2)
3.c	Explain the reason of higher value of local oscillator frequency as compared to incoming signal frequency in super-heterodyne FM receiver.	(2)

4.a	Find the Nyquist rate for the following signals: (i) $s(t) = \text{Sinc } 400t \otimes \text{Sinc } 600t$ (ii) $s(t) = \text{Sinc}^3 400t \times \text{Sinc}^3 100t$	(1)
4.b	Describe the main drawback of using mixer in super-heterodyne AM receiver with a suitable diagram.	(2)
4.c	Explain the pulse code modulation with its block diagram.	(2)



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21, Nov.'2023 (9:00 AM - 10:00 AM)

Degree	B. Tech.	Branch	ECE
Semester	III		
Subject Code & Name	ECC303: ELECTROMAGNETIC FIELD THEORY		
Time: 60 Minutes	Answer All Questions	Maximum: 20 Marks	

Sr. No.	Question	Marks
1.a	Draw a flow chart that shows the classification of different types of materials based on conductivity property. Give at least one example of each class.	(1)
1.b	Two point charges $1mC$ and $-2mC$ are located at $(3,2,-1)$ and $(-1,-1,4)$ respectively. Calculate the electric force on $10nC$ charge located at $(0,3,1)$ and the electric field intensity at that point.	(2)
1.c	Two point charges $-4\mu C$ and $5\mu C$ are located at $(2,-1,3)$ and $(0,4,-2)$ respectively. Find the potential at $(1,0,1)$, assuming zero potential at infinity.	(2)
2.a	Determine electric flux density at point $(4,0,3)$ if there is a point charge $-5\pi mC$ at $(4,0,0)$.	(1)
2.b	Why a perfect conductor is termed as equipotential body?	(2)
2.c	Given that the electric field intensity $E = (3x^2 + y)a_x + xa_y$ kV/m Find the work done in moving a $-2\mu C$ charge from point $(0,5,0)$ to point $(2,-1,0)$ in a straight line path.	(2)
3.a	Define one Volt. Can electric field intensity be calculated using electric potential?	(1)
3.b	Two dipoles with dipole moments $-5a_z$ nC.m and $9a_z$ nC.m are located at points $(0,0,-2)$ and $(0,0,3)$ respectively. Find the potential at the origin.	(2)
3.c	Two point charges Q_1 and Q_2 having magnitudes 4 nC and 6 nC respectively are placed at $(1,1)$ and $(5,7)$ respectively. Find the equation of the locus on which the electric field intensities due to Q_1 and Q_2 are equal.	(2)

4.a	<p>The gravitation force between two bodies of masses m_1 and m_2 is</p> $F_g = \frac{Gm_1m_2}{r^2} a_r$ <p>where $G = 6.67 \times 10^{-11} N(m/kg)^2$. Find the ratio of the electrostatic and gravitational forces between two electrons.</p>	(1)
4.b	<p>"For symmetric charge distribution, Gauss law can be used to evaluate electric field strength." Is the given statement true or false? Justify the answer.</p>	(2)
4.c	<p>Derive the Poisson's and Laplace's equations. Write down at least one application of Laplace's equation.</p>	(2)

*** GOOD LUCK ***

$$\oint A \cdot ds = \int \nabla A \, dv.$$