ECE 33

Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7032

B.E. / B. Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC. 2022 / JAN. 2023
Third Semester
Electronics and Communication Engineering
U19EC305 – SIGNALS AND SYSTEMS
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define periodic signal with an example.	2	K1	CO2
2.	Differentiate between "continuous time" & "discrete time" signals with the help of diagram.	2	K4	CO2
3.	State any two properties of Fourier transform.	2	K1	CO3
4.	*"If a square wave is analyzed using Fourier series, infinite frequency components are present in it."* What does this statement signifies?	2	K3	CO1
5.	Find Laplace transform of x(t) = $t^4 + 2t^3 - 3$	2	K3	CO2
6.	Define state variable with an example.	2	K1	CO2
7.	Why the ROC (region of convergence) of Z transform is circular shape?	2	K2	CO5
8.	Define a unilateral Z transform.	2	K1	CO5
9.	Write the system function of following difference equation y(n) = x(n)+ 2x (n-1)	2	K3	CO5
10.	Find Z transform of $x(n) = a^{n-1}u(n-1)$	2	K3	CO5

PART – B

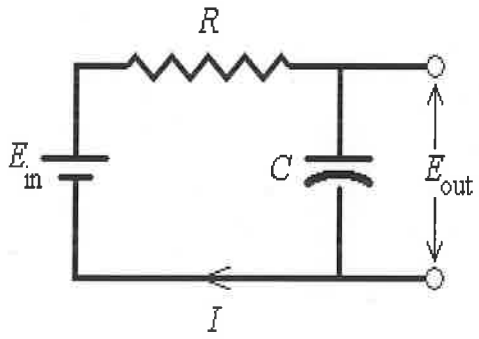
(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	State the significance of Linear Time Invariant (LTI) Systems. How to check a given system is LTI? Explain with one example.	13	K2	CO1
		(OR)			
	b)	Define (with mathematical equations & diagram) following continuous time signals: Unit impulse, unit step, unit ramp. Why are they important to study?	13	K1	CO1
12.	a)	i. Find the trignometric Fourier series for the signal $x(t)= t$ for $-1 \leq t \leq 1$.	7	K3	CO2
		ii. State and prove any 4 properties of Fourier transform	6		
		(OR)			
	b)	i. State and prove any 4 properties of Laplace transform.	7	K3	CO2
		ii. Find the Laplace Transform of the signal $x(t) = e^{-at}u(t)+e^{-bt}u(-t)$	6		
13.	a)	State and prove the convolution property of Laplace transform (Convolution integral).	13	K1	CO2
		(OR)			
	b)	Find the Laplace transform from the differential equation $y'' + y = t$, $y(0) = 1$, $y'(0) = 0$ and hence find the complete solution in time domain.	13	K3	CO2
14.	a)	State Nyquist theorem of sampling process & prove the same.	13	K1	CO5
		(OR)			
	b)	State and prove the Parseval's Theorem for Discrete Time Fourier transform (DTFT).	13	K2	CO3
15.	a)	Find the discrete time sequence for the following system transfer function. $$H(z) = \frac{[3 - 9/2\, z^{-1} + 3/8\, z^{-2}]}{(1 + \frac{1}{4} z^{-1})(1 - \frac{1}{2} z^{-1})(1 - 2 z^{-1})}$$	13	K3	CO4
		(OR)			
	b)	Solve the following difference equation with the help of Z transform: $y[n] + 4y[n-1] + 4y[n-2] = 0$ Given, $n \geq 0$ & $y[-1] = y[-2] = 1$	13	K3	CO4

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	The input to a discrete causal LTI system is given as $x(n) = (1/2)^n u(n) + 2^n u(-n-1)$ the output is $y(n) = 6(1/2)^n u(n) - 6(3/4)^n u(n)$ Find the system transfer function H(z) ,impulse response and the region of convergence.	15	K3	CO4
		(OR)			
	b)	In the RC circuit shown here, there is no charge on the capacitor and no current flowing at the time t = 0.	15	K4	CO2

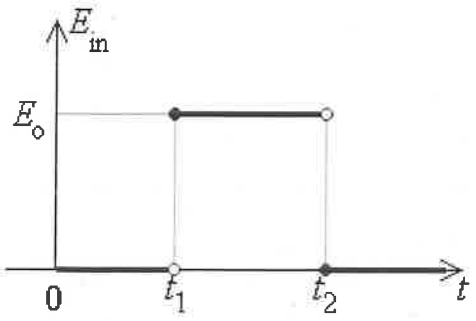


The input voltage E_{in} is a constant E_o during the time $t_1 < t < t_2$ and is zero at all other times.

Find the output voltage E_{out} for this circuit with the help of differential equation & Laplace transform. Plot the output voltage also.

Initial conditions:

$q(0) = i(0) = 0$ $\quad \left[\text{Note: } \frac{dq}{dt} = i\right]$



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[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7031

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC.2022 / JAN. 2023

Third Semester

Electronics and Communication Engineering

U19EC304 / U19EC315 - DIGITAL SYSTEM DESIGN

Biomedical Engineering

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

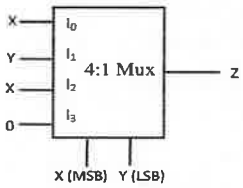
Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

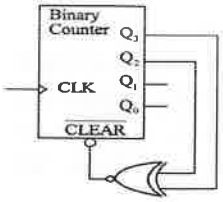
PART – A

(10 x 2 = 20 Marks)

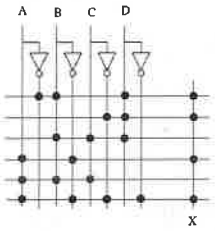
Q.No.	Questions	Marks	KL	CO
1.	Minimize the Boolean expression (A' + C) (A' + C')(A + B + C'D)	2	K1	CO1
2.	Find the min terms and max terms corresponding to equivalent of A⊕B+(C⊕D)'	2	K1	CO1
3.	Find the logic function implemented in the following diagram	2	K2	CO2



4.	Write down the difference between demultiplexer and decoder.	2	K1	CO2
5.	Mention the difference between the edge triggering and level triggereing.	2	K1	CO3
6.	The binary counter with synchronous clear input and the decodinglogic is shown. What are the values it will count?	2	K3	CO3



7.	Define bipolar SRAM cell.	2	K2	CO4
8.	Differentiate fundamental mode and pulse mode asynchronous sequential circuits.	2	K1	CO4
9.	Find the number of address lines, data lines and total memory size in bytes for a 2K x 16 RAM chip	2	K3	CO5
10.	Write the equations realized by the PLA.	2	K3	CO5



PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Draw the AND-OR gate implementation of the following function after simplifying it in a) Sum of products and b) Product of Sum F(A,B,C,D) = $\sum$ (0,2,5,6,7,8,10)	13	K2	CO1
		(OR)			
	b)	Minimize the given terms πM (0, 1, 4, 11, 13, 15) + πd (5, 7, 8) using Quine-McClusky methods and verify the results using K-map methods.	13	K2	CO1
12.	a)	i. Implement the truth table given below using	7	K2	CO2

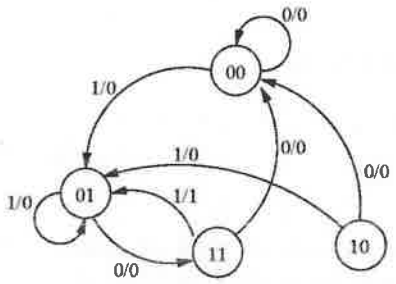
Inputs			Output
a	b	c	f
0	0	0	1
0	0	1	0
0	1	0	X
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	X
1	1	1	1

1) Minimum number of 3-to-8 Decoders and minimum number of simple logic gates
2) Minimum number of 8-to-1 Multiplexers and minimum number of simple logic gates
3) Minimum number of 4-to-1 Multiplexers and minimum number of simple logic gates

ii. The input code for a client-server system designed to serve eight clients will contain a 1 in any of its bit positions when a request is raised by a client for service. Assume that the highest priority is assigned to the client associated with the leftmost bit of the input code. Obtain the truth table and realize the logic circuit. — 6 K3 CO2

(OR)

b)	i.	Implement all the following Boolean expressions using only 3 half adders and minimum number of gates. $V = A \oplus B \oplus C$ $X = A' BC + AB'C$ $Y = ABC' + (A' + B') C$ $Z = ABC$	4	K2	CO2
	ii.	Design a digital circuit that takes two 4-bit numbers A and B as input and generates output Z as follows using full adder, decoder and multiplexer and gates • If A and B are odd numbers then Z=A-B • If A and B are even numbers then Z=B-A • If A is an even number and B is an odd number then Z=A+B • If A is an odd number and B is an even number then Z=A-B-1 Use minimum number of full adder, decoder and multiplexer and gates	9	K3	CO2
13. a)		Design the sequential circuit specified by the state diagram given below using JK flip-flops. Assuming the state bits are labeled Q_1 and Q_0.	13	K6	CO3



(OR)

b)	Implement a counter that counts the sequence 0, 1,2,3,4,7,0 ,.... using T flip-flops. Augment the state diagram to make it self correcting showing all counter states and transitions, including all unused states, and all transitions. Explain clearly the steps to solve the problem. Modify the implementation to make it self correcting.	13	K3	CO3
14. a)	With an example, explain the use of algorithmic state machines.	13	K2	CO4

(OR)

b)	Design a JK flip-flop by using Verilog program.	13	K2	CO4
15. a)	i. Using a D-flip flop and minimum number of gates, design a binary cell, which can perform read/write operations based on the signal, r/w when the memory enable signal named, mem_en is active.	6	K3	CO5

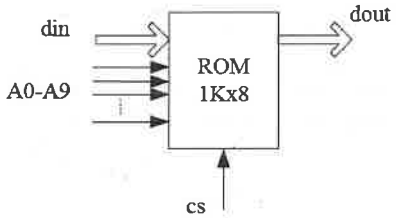
ii. Realize the following state table using a clocked D flip-flop (use PLA to implement input equation)

	Input (WXY =)								Output
	000	001	010	011	100	101	110	111	Z
a	a	a	b	b	b	b	a	a	0
b	a	b	b	a	a	b	b	a	1

7 K4 CO5

(OR)

b) i. Design a memory of size 8KX8 using a 3:8 decoder and the minimum number of ROMs of size 1KX8 shown in the following diagram. cs is the chip select signal, which is active high. Also show the complete address map. 8 K4 CO5



ii. Construct a 5-LUT from a collection of 4-LUTs. 5 K3 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	A Mealy circuit has an input **x** and two outputs **z1** and **z2**. The output **z1** becomes 1 when 1011 sequence is found on x, and the **z2** output becomes 1 when a 111 sequence is found on **x**. Draw the state diagram using minimum number of states. Also design the circuit.	10	K5	CO3
	ii.	Write the Verilog description for the state machine.	5		CO4

(OR)

b) Design an FSM that outputs a "1" if the aggregate serial binary input is divisible by 5. A sample input and output sequence is shown below 15 K5 CO3

Input	Sequence	Value	Output
1	1	1	0
0	10	2	0
1	101	5	1
0	1010	10	1
1	10101	21	0

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Question Paper Code: 7028

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC.2022 / JAN.2023
Third Semester
Electronics and Communication Engineering
U19EC303 – ELECTRONIC CIRCUITS - I
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Why is the operating point chosen near the center of the active region of the transistor characteristics in a transistor amplifier?	2	K2	CO1
2.	Why is fixed bias circuit not commonly used?	2	K2	CO1
3.	What is a Darlington pair?	2	K1	CO2
4.	What characteristic of the common-collector amplifier makes it a useful circuit?	2	K1	CO2
5.	What is Differential Amplifier?	2	K2	CO3
6.	Define common- mode- rejection ratio.	2	K1	CO3
7.	State Miller effect.	2	K1	CO4
8.	What do you mean by Unity Gain BW in MOSFET Amplifier?	2	K1	CO4
9.	What is the significance of Class C amplifier?	2	K1	CO5
10.	What are distortions in power amplifiers?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

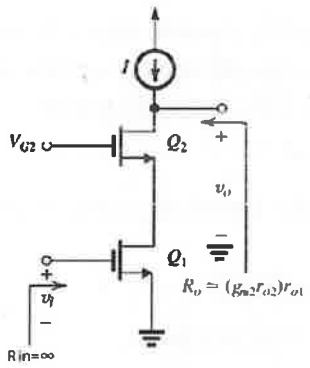
Q.No.	Questions	Marks	KL	CO
11. a)	Draw the following circuits using NPN transistors and derive the expressions for the operating point for each of the cases:		K3	CO1
	i. Fixed bias configuration	7		
	ii. Voltage- divider configuration	6		

(OR)

	b)	With the help of neat diagrams, describe the operation of N-channel depletion and enhancement MOSFETs.	13	K1	CO1
12.	a)	Compare and contrast the parameters of CB, CC, CE amplifiers. Give application of each amplifier.	4+4+5	K3	CO2

(OR)

	b)	A BJT differential amplifier is biased from a 1 mA constant-current source and includes a 200 Ohm resistor in each emitter. The collectors are connected to Vcc via 12 Kohm resistor. A differential input signal of 0.1V is applied between the two bases. i. Find the signal current in the emitters (I_E) and the signal voltage Vbe for each BJT. ii. What is the total emitter current in each BJT? iii. What is the signal voltage at each collector? Assume $\alpha = 1$.	13	K4	CO2
13.	a)	Design the cascode amplifier shown at the figure to obtain g_{m1}=1mA/V and R_o=400kΩ. Use a 0.18μm technology for which V_{tn}=0.5 V, V_A=5V/μm and k_n=400 μA/V^2. Determine L, W/L, V_{G2}, and I. Use identical transistors operate at Vov=0.2V, and design for the maximum possible negative signal swing at the output (when Vds= Vov).	13	K5	CO3

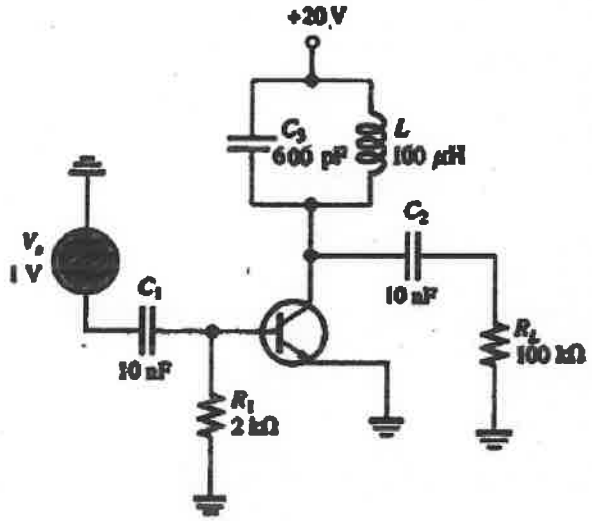


(OR)

	b)	i. What is BiMOS cascode amplifier? Explain.	3	K2	CO3
		ii. Explain its working principle with circuit diagram and write its application.	10		
14.	a)	A MOSFET amplifier with a common source is designed with an n-channel MOSFET. Its threshold voltage (Vth) is 1.5 volts and conduction parameter (K) is 40mA/V^2. If the voltage supply is +20 volts & the load resistor (R_L) is 450 Ohms. Find out the values of the required resistors to bias the MOSFET amplifier at 1/4(V_{DD}). For an undistorted & symmetrical o/p waveform, fix the DC biasing voltage for the drain terminal of the MOSFET to half the voltage supply.	13	K4	CO4

(OR)

b)	i.	What is the difference between low frequency response and high frequency response of MOSFET? Explain.	10	K3	CO4
	ii.	What do you mean by short circuit current gain? Explain.	3		
15. a)		For class C amplifier in the following figure, analyze and find:			
	i.	Base voltage of transistor.	3	K4	CO5
	ii.	If the class C amplifier (tank circuit) has an additional capacitor (C_4= 500pF) connected in a series with C_3, determine its resonant frequency.	5		
	iii.	If the class C amplifier has a power dissipation of 20mW and an output power 1W, determine its efficiency.	5		



(OR)

b)	i.	Explain the working principle of transformer coupled class A amplifier.	9	K1	CO5
	ii.	Explain its advantages and applications.	4		

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16. a)		Draw a single stage CE amplifier. Choose the voltages and resistors of your choice and find the Voltage gain, current gain and power gain for your design. Derive the expressions.	15	K3	CO5
		(OR)			
b)		Draw the small signal equivalent circuit for a common-source MOSFET amplifier. Derive all the necessary equations (voltage gain, input impedance, output impedance) Explain the steps.	15	K3	CO4

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Question Paper Code: 7026

B.E./ B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC.2022 / JAN.2023
Third Semester
Electronics and Communication Engineering
U19EC302 – ELECTRON DEVICES
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

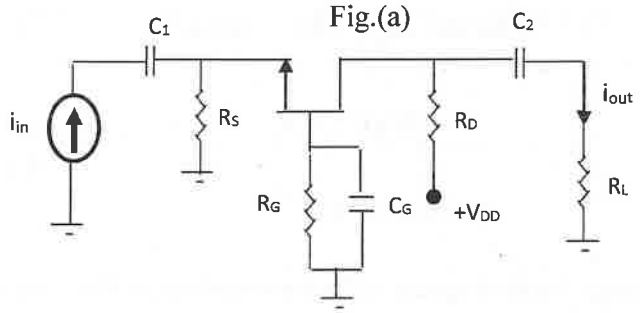
Q.No.	Questions	Marks	KL	CO
1.	Draw the energy band diagram of a forward-biased PN junction diode.	2	K1	CO1
2.	Define built-in potential barrier.	2	K1	CO1
3.	Name different modes of operation of NPN transistor.	2	K1	CO2
4.	What is the concept of multi emitter transistor?	2	K1	CO2
5.	Define the pinch-off voltage for n-channel JFET.	2	K1	CO3
6.	What is MESFET? Why is it called so?	2	K1	CO3
7.	Define photon absorption coefficient.	2	K1	CO4
8.	Mention the advantages & applications of APD.	2	K1	CO4
9.	Draw the 2 transistor model of SCR. Write the applications of SCR.	2	K1	CO5
10.	How does an UJT act as a switch?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	With the help of energy-band diagrams, explain the breakdown mechanisms in Zener diode.	13	K2	CO1
		(OR)			
	b)	With the help of energy-band diagrams, obtain the VI characteristics of Tunnel diode.	13	K2	CO1
12.	a)	Obtain the hybrid-π equivalent circuit for a NPN transistor.	13	K3	CO2
		(OR)			
	b)	Obtain the basic Ebers-Moll equivalent circuit for a NPN transistor.	13	K3	CO2
13.	a)	For the circuit shown in Fig.(a) below,			
		i. draw small signal model (assume $r_d = \infty$) and	5	K4	CO3
		ii. derive the expression for $A_i = (i_{out} / i_{in})$, where i_{in} is a small ac signal.	8		

Fig.(a)



(OR)

	b)	In the circuit shown in Fig. (b) below, both the JFETs have I_{DSS} = 16 mA and V_p = -5 V. M_1 is in active region and M_2 is in ohmic region. Find i_D and v_{DS} for both JFETs.	7+6	K4	CO3

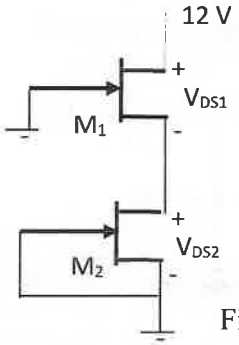


Fig.(b)

14.	a)	With the help of schematic diagram, explain the principle of working of PIN diode.	13	K2	CO4
		(OR)			
	b)	With the help of schematic diagram, explain the principle of operation of LASER diode.	13	K2	CO4

15. a) With the help of schematic diagram, explain the principle of operation of SCR. 13 K3 CO5

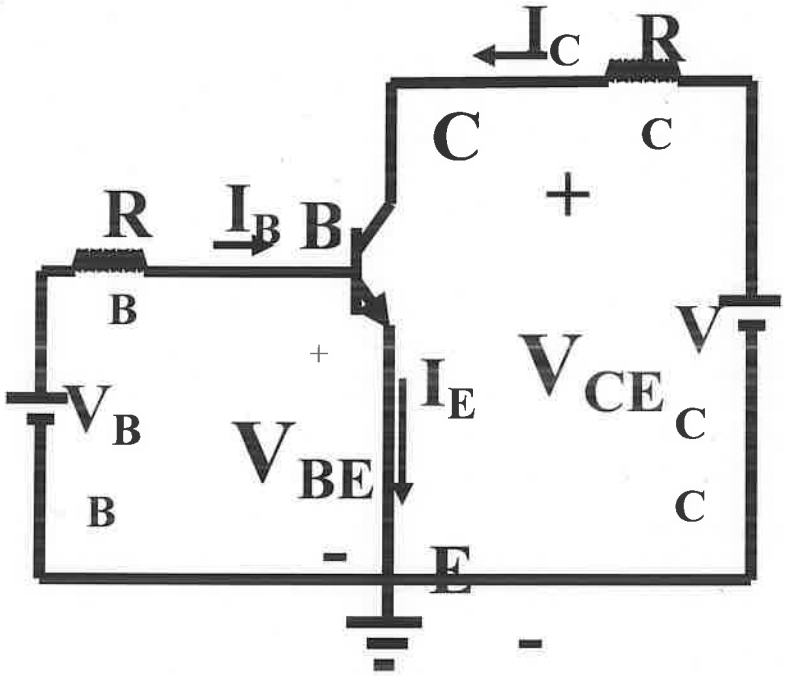
(OR)

b) With the help of schematic diagram, obtain the frequency of oscillation of relaxation oscillator using UJT. 13 K3 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	For the CE transistor circuit shown in Fig. below, given that $V_{BB} = 5$ V, $V_{CC} = 15$ V, $R_B = 100$ kΩ, $R_C = 2$ kΩ, $\beta = 100$, $V_{BE,\,ACTIVE} = 0.7$ V and $I_{CBO} \approx 0$ mA. Assume active region of operation for npn transistor. Determine the values of I_C and V_{CE}.	8+7	K5	CO2



(OR)

b) At 300 K, the intrinsic concentration of silicon (Si) is 1.5×10^{16} m^{-3}. The free electron mobility is 0.13 m^2/V-s and the hole mobility is 0.05 m^2/V-s. The density of Si is 5×10^{28} atoms/m^3. One side is doped with one part per 10^8 of an acceptor impurity, and the other side is doped with one part per 10^7 of a donor impurity.

i.	Calculate the conductivity of p-side and n-side.	8	K5	CO1
ii.	Find the contact potential across the resulting *pn* junction.	7		

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Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 8023

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC.2022 / JAN.2023

Third Semester

Electronics and Communication Engineering

U19EE303 – ANALOG ELECTRONICS

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Mention the applications of a diode and zener diode.	2	K1	CO1
2.	"An FET is a better buffer than BJT"- Say True or False and justify your answer.	2	K2	CO1
3.	Draw the circuits of CB, CE and CC configurations using npn transistor.	2	K1	CO2
4.	Determine the linear amplification factor of a transistor if its gain is 100.	2	K3	CO2
5.	The voltage gain of an amplifier without feedback is 3000. Calculate the voltage gain of the amplifier with negative voltage feedback fraction mv = 0.01.	2	K4	CO3
6.	Define the input resistance with feedback for voltage series feedback amplifier.	2	K1	CO3
7.	Name the different oscillator types and write its use	2	K2	CO4
8.	Illustrate the series resonant and parallel resonant conditions of the crystal.	2	K2	CO1
9.	Draw the block diagram of a DC power supply.	2	K1	CO5
10.	Calculate the ripple factor of a full wave rectifier with 100 micro Farad filter capacitor connected to a load drawing 50 milli-amperes.	2	K4	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	For the Fig:1shown below, calculate I_B, I_C, V_{CE}, V_B,V_C and V_{BC}. Assume V_{BE}= 0.7V and β = 50.	10	K4	CO1

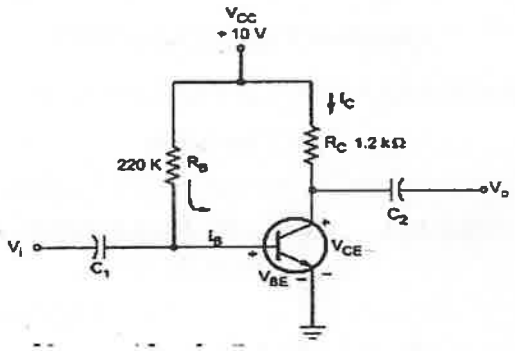

Fig:1

		ii.	In the Fig:2 shown below, the ideality factor h of the diode is unity and the voltage drop across it is 0.7 V. Calculate approximately the dynamic resistance of the diode at room temperature.	3	K4	CO1

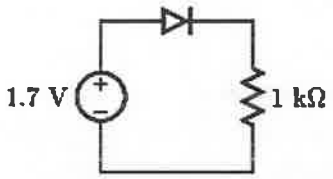

Fig:2

(OR)

	b)	i.	Realise an AND and OR gates with PN junction diode.	7	K2	CO1
		ii.	Explain frequency response of BJT amplifier.	6	K3	CO1
12.	a)		Derive the expressions for gain, input impedance and output impedance for a CE amplifier.	13	K3	CO2

(OR)

	b)		Determine whether the transistor is biased in cutoff, saturation or linear region for the Fig:3 shown below.	13	K4	CO2

(a) R_B= 75KΩ , R_C=1KΩ; saturation
(b) R_B= 150KΩ , R_C=1KΩ; linear
(c) R_B= 75KΩ , R_C=2KΩ; saturation

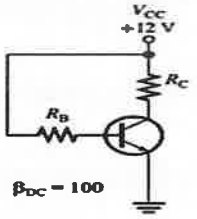

Fig:3

13.	a)	Explain how negative feedback improves stability, reduce noise and increase input impedance, with suitable diagram & equations.	13	K1	CO3
		(OR)			
	b)	Explain current shunt and voltage shunt feedback amplifiers.	13	K1	CO3
14.	a)	Derive the condition for oscillation in a RC phase shift oscillator with a circuit and list applications of the oscillator.	13	K3	CO4
		(OR)			
	b)	Explain how Wien bridge is used as oscillator circuit to measure the unknown frequency of a sine wave.	13	K1	CO4
15.	a)	Describe the working, characteristics and waveform of choke filter or L-section Filter.	13	K2	CO5
		(OR)			
	b)	i. Explain the application of Zener diode as voltage regulator with a circuit.	7	K3	CO5
		ii. Explain a shunt voltage regulator with a block diagram.	6	K1	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Derive the expressions for gain, input impedance and output impedance for a CE amplifier.	15	K3	CO2
		(OR)			
	b)	Explain a series regulator circuit and calculate the output voltage and zener current in the regulator of Fig:4.	15	K5	CO5

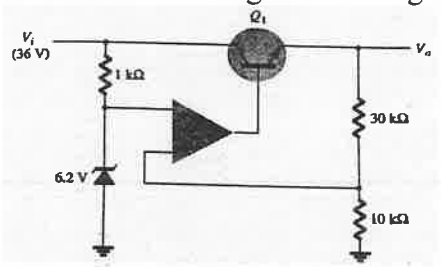

Fig:4

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
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Question Paper Code: 3001

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DEC.2022 / JAN. 2023
Second Semester
Electrical and Electronics Engineering
U19PH207 – ENGINEERING PHYSICS
(Common to Electronics and Communication Engineering
and Biomedical Engineering)
(Regulation2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 ×2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	A wire elongates by 1.0 mm when a load W is hung from it. If this wire goes over a pulley and two weights W each are hung at the two ends, what would be the elongation in wire?	2	K3	CO2
2.	What happens with the energy level when water droplets merge to form a bigger drop?	2	K2	CO1
3.	What is the relationship between average kinetic energy and Fermi energy of an electron at same temperature?	2	K1	CO3
4.	Why thermal energy transfer is treated a random process?	2	K2	CO1
5.	What is the relationship between interplanner distance d and adjacent planes or a set of parallel planes of the Miller indices?	2	K1	CO3
6.	For diatomic crystal Si, calculate the atomic packing factor. Lattice constant of Si is 5.43×10^{-8} cm.	2	K5	CO3
7.	Sketch the variation of Fermi level with temperature for n-type semiconductor.	2	K5	CO4
8.	What do you mean by the metallic glass? How they are different from common glass?	2	K1	CO3

9.		What is the relationship between Einstein's A and B coefficients with the frequency?	2	K1	CO3
10.		What are the conditions to be satisfied for total internal reflection?	2	K4	CO5

PART – B

(5×16 = 80 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the experimental method to determine Young's modulus of a material by non-uniform bending method.	16	K3	CO2
		(OR)			
	b)	Derive the expression for the rate of flow of viscous fluid through a cylindrical tube.	16	K5	CO1
12.	a)	What are the postulates of classical free electron theory? Derive expression for electrical conductivity and thermal conductivity based on the theory.	4+12	K5	CO2
		(OR)			
	b)	The normalized wave function $\psi = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}$ describes a particle in a one-dimensional box of length L. What is the expectation value of the particle's position $<x>$?	16	K3	CO2
13.	a)	What do you mean by crystal imperfection and what are it's effect on crystal? Also, mention the causes of imperfections in crystals.	12+4	K2	CO1
		(OR)			
	b)	Define Miller indices. Silver has FCC structure and its atomic radius is 1.441A°. Find the spacing of (220) and (111) planes.	6+10	K3	CO2
14.	a)	Ge has a donor type impurity added to the extent of one atom per 10^8 Ge atom. What effect does this have on the conductivity of the material at 300°K, when μ_n = 3900 $cm^2/V.s$, μ_p = 1900 $cm^2/V.s$, No. of atoms of Ge/cc = 4.42×10^{22} and $(n_i)^2 = 6.25 \times 10^{26}/cc$?	16	K5	CO4
		(OR)			
	b)	Discuss shape memory effect. What are the characteristics of shape memory alloys which make them highly useful in many applications?	4+12	K1	CO3
15.	a)	Explain the operation of a semiconductor diode laser with diagram showing essential components. Also, discuss how operation of a diode laser is different from light emitting diode.	12+4	K2	CO5
		(OR)			
	b)	The numerical aperture of an optical fiber is 0.5 and core refractive index is 1.54. Find the refractive index of cladding and calculate the change in core cladding refractive index per unit refractive index of the core. Also, calculate the critical angle.	12+4	K5	CO5

15.	a)	i.	Compare and contrast between object oriented and XML databases.	7	K3	CO5
		ii.	Give XML representation of bank management system and also explain about Document Type Definition and XML Schema.	6	K4	
			(OR)			
	b)		Discuss in detail about the recovery techniques that can be applied to the common types of database failure.	13	K4	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Explain in detail about Database Security.	7	K3	CO5
		ii.	Elaborate on Distributed databases.	8		
			(OR)			
	b)		Discuss in detail about the ACID properties of a transaction.	15	K3	CO5