BME.



Reg.No.:				



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNĀ UNIVERSITY, CHENNAI] Elayampalayam — $637\ 205$, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 12007

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

Third Semester

Biomedical Engineering

U19BM303 - FUNDAMENTALS OF BIO CHEMISTRY

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

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

PART – A

	(10)	x 2 = 20 Marks			
Q.No.	Questions	Marks	KL	CO	
1.	Calculate the pH of a solution whose hydrogen concentration is 5.6x10 ⁻⁵ mol/L.	2	K2	CO1	
2,	Enlist the applications of radioisotopes in a biological system.	2	K3	CO1	
3.	Mention the role of glucokinase in the regulation of blood glucose.	2	K2	CO2	
4.	State the chemical properties of carbohydrates	2	K1	CO2	
5.	What are called derived lipids? Give examples.	2	K2	CO3	
6.	Identify the disorders of lipid metabolism.	2	K1	CO3	
7.	Draw the structure of ATP.	2	K1	CO4	
8.	Define chargoffs rule.	2	K2	CO4	
9.	Compare the function of apoenzyme, coenzyme and haloenzyme.	2	K1	CO5	
10.	Enlist the factors affecting enzymatic activity.	2	K2	CO5	

PART - B

 $(5 \times 13 = 65 \text{ Marks})$

		(3 X 1.	3 = 63 r	viark	S)
Q.	.No.	Questions	Marks	KL	CO
11.	a)	Derive on how the behavior of weak acids and buffers are described by Handerson-Hasselbalch equation.	13	K2	CO1
		(OR)			
	b)	Illustrate and explain the fluid mosaic model of membrane structure.	13	K1	CO1
12.	a)	Outline the classification of carbohydrates with its physiological importance.	13	K1	CO2
		(OR)			
	b)	Describe the metabolic pathways involved in glycolysis with its clinical significance.	13	K2	CO2
13.	a)	Elaborate on the classification of lipids with its physiological importance.	13	K1	CO3
		(OR)			
	b)	Explain the main pathways for De Novo synthesis of fatty acids that occurs in the cytosol.	13	K2	CO3
14.	a)	Justify how DNA acts as a genetic material and discuss about the Watson and Crick model of DNA with neat diagram.	13	K2	CO4
		(OR)			
	b)	Describe the classification and properties of proteins.	13	K1	CO4
15.	a)	Brief on how Michaelis-Menten equation is used to determine Km and Vmax and add a note on factors affecting the enzymatic activity.	13	К3	CO5
		(OR)			
	b)	Outline about the measurement of enzyme activity and interpretation of units.	13	K3	CO5
		PART – C			
Q.1	No.	Questions (1 x 1:	5 = 15 N Mark		s) KL CO
16.	a)	Summarize the biochemical aspect of Diabetes mellitus and Glycogen storage disease.	1 15	I	ζ3 CO2
		(OR)			
	b)	Elaborate on the different methods involved in the process of separation of proteins.	f 15	I	ζ3 CO4

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Question Paper Code: 7029

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

Third Semester

Biomedical Engineering

U19EC316 - ELECTRON DEVICES AND CIRCUITS

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

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

PART – A

	(10	x = 20	Mark	s)
Q.No.	Questions	Marks	KL	CO
1.	Define ripple factor and PIV.	2	K1	CO1
2.	What is meant by depletion region?	2	K2	CO2
3.	Why BJT is called as a current Controlled Device?	2	K2	CO2
4.	Define IGBT.	2	K1	CO2
5.	Compare CE,CB,CC amplifier.	2	K2	CO1
6.	Why bypass and coupling capacitor are used in amplifier circuits?	2	K1	CO1
7.	What are the applications of differential amplifier?	2	K3	CO3
8.	Differentiate between common mode and Differential mode.	2	K1	CO2
9.	Define the positive feedback	2	K2	CO2
10.	Give the effect of negative feedback on amplifier characteristics.	2	K2	CO1
	PART – B			
	(5 x	13 = 65	Marks	s)
Q.No.	Questions	Marks	KL	CO
11. a)	Explain the forward and reverse bias operation and VI characteristics of a PN junction diode.	13	K2	CO2
	(OR)			
b)	Explain the working principle of centre-tapped full wave rectifier (with and without filter) with neat diagrams.	13	K4	CO2

12.	a)	Explain the operation of PNP and NPN transistor.	13	K1	CO2
		(OR)			
	b)	i. Compare the Characteristics JFET and MOSFET.ii. Give a detailed description of construction and operation of JFET.	3 10	K2	CO2
13.	a)	Explain in details on voltage and current gain expression for CB configuration using hybrid model.	13	K3	CO2
		(OR)			
	b)	i. Define h-parameters.ii. Explain the analysis of CE small signal amplifier using h-parameter.	3 10	K2	CO2
14.	a)	i. Define differential amplifier.	3	K1	CO3
		ii. Draw the circuit diagram and explain the working of differential amplifier.	10		
		(OR)			
	b)	Explain the biasing techniques of JFET under different conditions.	13	K2	CO3
15.	a)	With suitable block diagram, derive the expression for input and output resistances for			
		i. Voltage series & voltage shunt amplifier	7	K3	CO2
		ii. Current series & shunt amplifier	6		
		(OR)			
	b)	Explain the principle of operation and derive the expression for Wein Bridge oscillator.	13	K2	CO2
		PART - C			
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Q.N		Questions	Marks	KL	CO
16.	a)	i. Explain the characteristics and applications of Zener diode.	9	K2	CO4
		ii. Explain the mechanism of Avalanche and Zener breakdown.	6	K2	
		(OR)			
8	b)	i. State the difference between Depletion mode MOSFETs and Enhancement mode MOSFETs.	4	K3	CO3
		ii. Explain the construction, principle of operation, characteristics and application of IGBT.	11	K2	

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[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI] Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 12006

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

Third Semester

Biomedical Engineering

U19BM302 - BIO SENSORS AND MEASUREMENT DEVICES

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

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

PART – A

	$(10 \times 2 = 20 \text{ Marks})$							
Q.No.	Questions	Marks	KL	CO				
1.	The voltage drop expected across a resistor is 4V. A multimeter connected across the resistor measures this voltage as 3.98V. Find the % error in measurement and the % accuracy of the multimeter reading.	2	K3	CO1				
2.	What is a transducer? Show how the transducers can be classified.	2	K1	CO1				
3.	Strain Gauges can be considered as secondary transducers. Give the reason behind this.	2	K2	CO2				
4.	Compare the characteristics of capacitive and inductive transducers. Which one among them will be most suitable to measure displacement?	2	K4	CO2				
5.,	State the Principle of photodiode. Give its application.	2	K3	CO3				
6.	Compare the various types of photoelectric transducers.	2	K4	CO3				
7.	State the need for signal conditioning in measurement devices. List the steps involved in signal conditioning process.	2	K2	CO4				
8.	In a particular biosignal measurement system, it is observed that the signal is corrupted with power line interference. Suggest and justify a best solution to remove this noise.	2	K4	CO4				
9.	State the advantages of digital display over analog.	2	K2	CO5				
10.	State the purpose of electromagnet in an inkjet recorder.	2	K2	CO5				

PART - B

 $(5 \times 13 = 65 \text{ Marks})$ Marks Q.No. **Ouestions** KL CO Summarize the effects of gross, systematic and random errors in a 13 K2 11. a) CO₁ measurement system. How are they detected? Mention methods to reduce such errors. (OR) b) Illustrate & explain about the static and dynamic characteristics of a 13 K2 CO₁ measurement systems. Explain the differences between bonded and unbounded strain 12. 13 K4 CO₂ gauges. If a portion of human skin, around 2cm², is modeled using an array of strain gauges, draw the schematic and associated electronic circuitry. (OR) Give the temperature range over which Platinum material has 13 K4 CO2 stability. A probe is to be built to deliver controlled heat for therapeutic purpose. If the size of probe head is around 2cm², identify the transducer that can be employed and explain along with the schematic diagram. 13. a) With a neat illustration, describe the working and applications of an 13 K3 CO₃ optical encoder. (OR) With a schematic diagram, explain the working mechanism of 13 K3 CO₃ scintillation counter. Discuss the significance of photomultiplier tube. 14. a) Identify the difficulties associated with the measurement of low 13 K3 CO4 resistance. Explain the methods involved in the measurement of low resistance. (OR) Outline the functions of signal conditioning circuit with the help of a 13 CO₄ block diagram. With a neat diagram, explain the construction and operation of a 13 CO₅ PMMC instrument. Comment on its accuracy and applications.

K3 CO5

13

(OR)

b) With a neat diagram explain the construction and working principle

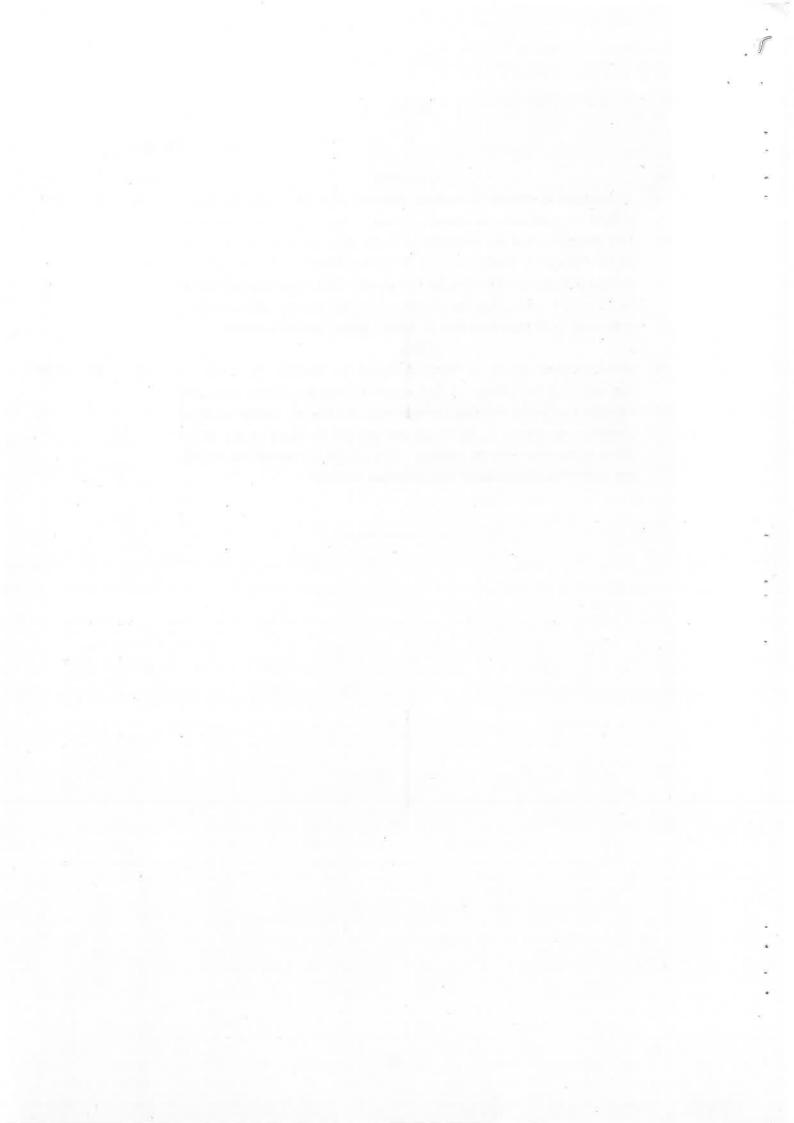
with CRO.

of a Digital Storage Oscilloscope. Compare the features of DSO

PART – C

 $(1 \times 15 = 15 Marks)$

Q.N	Vо.	Questions	Marks	KL	CO
16.	a)	A biomedical device is used to measure Galvanic Skin Response	15	K6	CO4
		(GSR). A constant, low current circuit is typically created between			
		two electrodes that are in contact with the skin. The GSR is measured			
		as the changes in conductance of the current based on the sweat level.			
		Design a signal conditioning system for this GSR measurement device			
		based on the noises that can interfere with the reading. Also, design a			
		schematic to display the value on a DSO and a thermal recorder.			
		(OR)			
	b)	A biomedical device is being designed to measure the angle of	15	K6	CO4
		movement at the elbows. A flex sensor is used that shows resistance			
		changes due to the bending movement at the elbows. Design a signal			
		conditioning system for this measurement device based on the noises			
		that can interfere with the reading. Also, design a schematic to display			
		the value on a digital meter and a thermal recorder.			



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[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI] Elayampalayam $-637\ 205$, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 12005

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

Third Semester

Biomedical Engineering

U19BM301 – ANATOMY AND HUMAN PHYSIOLOGY

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

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

PART - A

		$(10 \times 2 = 20 \text{ Marks})$			
Q.No.	Questions	Marks	KL	CO	
1.	Draw and label the structure of Cell	2	K2	CO1	
2.	Define action potential.	2	K1	CO1	
3.	Mention any three bones with its functions.	2	K1	CO2	
4.	Write the characteristics of the skeletal muscle.	2	K1	CO2	
5.	Mention the physiological factors affecting blood pressure.	2	K2	CO1	
6.	Define cardiac cycle.	2	K1	CO1	
7.	What are the three covering of eye ball?	2	K2	CO3	
8.	Name the bones present in the ear. Give their uses	2	K2	CO1	
9.	Write any two functions of kidney.	2	K2	CO2	
10.	Define urinary reflex.	2	K1	CO1	

PART – B

No. a)	Questions Explain the types of specialized tissues and their functions.	Marks 13	KL K2	CO CO2
	(OR)			
b)	Describe the structure and functions of cell with an illustration.	13	K3	CO2
a)	Describe the classification of joints. Explain the structure &	13	K3	CO1
	functions of the synovial joint.			
	(OR)			
b)	Enumerate the parts of respiratory system and explain their	13	K3	CO2
	functions with necessary illustrations.			
a)	Draw and explain the structure of heart with its conducting system.	13	K3	CO3
	(OR)			
b)	Elaborate the parts and functions of lymphatic system with	13	K2	CO3
	illustrations.			
a)	Identify the various parts of the brain. Describe their structure and	13	K3	CO4
	function with necessary illustrations.			
	(OR)			
b)	Outline the structure & function of the nervous system.	13	K4	CO4
a)	Draw and label the structure of kidney and detail on the process	13	K3	CO5
	involved in the formation of urine.			
	(OR)			
b)	Enumerate the organs of digestion. Explain the process of	13	K3	CO5
	digestion.			
	PART – C			
	a)b)a)b)a)	 a) Explain the types of specialized tissues and their functions. (OR) b) Describe the structure and functions of cell with an illustration. a) Describe the classification of joints. Explain the structure & functions of the synovial joint. (OR) b) Enumerate the parts of respiratory system and explain their functions with necessary illustrations. a) Draw and explain the structure of heart with its conducting system. (OR) b) Elaborate the parts and functions of lymphatic system with illustrations. a) Identify the various parts of the brain. Describe their structure and function with necessary illustrations. (OR) b) Outline the structure & function of the nervous system. a) Draw and label the structure of kidney and detail on the process involved in the formation of urine. (OR) b) Enumerate the organs of digestion. Explain the process of digestion. 	a) Explain the types of specialized tissues and their functions. (OR) b) Describe the structure and functions of cell with an illustration. a) Describe the classification of joints. Explain the structure & 13 functions of the synovial joint. (OR) b) Enumerate the parts of respiratory system and explain their functions with necessary illustrations. a) Draw and explain the structure of heart with its conducting system. (OR) b) Elaborate the parts and functions of lymphatic system with illustrations. a) Identify the various parts of the brain. Describe their structure and function with necessary illustrations. (OR) b) Outline the structure & function of the nervous system. 13 a) Draw and label the structure of kidney and detail on the process involved in the formation of urine. (OR) b) Enumerate the organs of digestion. Explain the process of digestion.	a) Explain the types of specialized tissues and their functions. (OR) b) Describe the structure and functions of cell with an illustration. a) Describe the classification of joints. Explain the structure & 13 K3 functions of the synovial joint. (OR) b) Enumerate the parts of respiratory system and explain their functions with necessary illustrations. a) Draw and explain the structure of heart with its conducting system. (OR) b) Elaborate the parts and functions of lymphatic system with illustrations. a) Identify the various parts of the brain. Describe their structure and function with necessary illustrations. (OR) b) Outline the structure & function of the nervous system. (OR) b) Outline the structure & function of the nervous system. (OR) b) Enumerate the organs of digestion. Explain the process of 13 K3 digestion.

 $(1 \times 15 = 15 \text{Marks})$

Q.No.	Questions	Marks	KL	CO
16. a)	Elaborate on the mechanism of regulation of blood pressure by urinary system.	15	K3	CO3
	(OR)			
b)	With suitable examples narrate the identification of ABO grouping. Explain Landsteiner's law.	15	K3	CO5

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[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI] Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7034

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

Second Semester

Biomedical Engineering

U19EC201– ELECTRIC CIRCUIT THEORY

(Common to Electronics and Communication Engineering) (Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

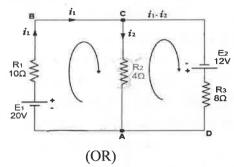
Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART - A

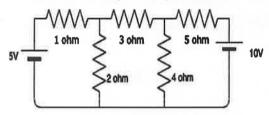
	($10 \times 2 = 20$	x 2 = 20 Marks	
Q.No	Questions	Marks	KL	CO
*)(
1.	State Kirchhoff's current law.	2	K1	CO1
2.	Sketch the various network topologies.	2	K2	CO1
3.	State maximum power transfer theorem.	2	K1	CO2
4.	Highlight the significance of source transformation.	2	K2	CO2
5.	A series RLC circuit has R=50ohm; L=100 μ H; and C=300 V=20. Calculate the current at resonance.	pf; 2	K3	CO3
6.	Differentiate self and mutual inductance.	2	K2	CO3
7.	Define Power Factor and Reactive Factor.	2	K1	CO4
8.	Find the Laplace transform of $x(t)=u(t)+\delta(t)$	2	K3	CO4
9.	List the Z parameters in two port network.	2	K2	CO5
10.	What are the admittance parameters in two port network?	-2	K2	CO5

 $(5 \times 13 = 65 \text{ Marks})$ Marks KL CO

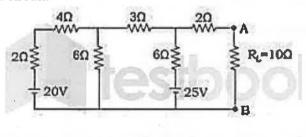
Q.No. Questions Marks KL CO 11. a) Three Resistor $R_1 = 10\Omega$, $R_2 = 4\Omega$ and $R_3 = 8\Omega$ are connected to two batteries of negligible resistance as shown in the Figure. Calculate the current through each resistor.



b) Find the value of the currents I1, I2 and I3 flowing clockwise in the 13 K3 CO2 first, second and third mesh respectively.

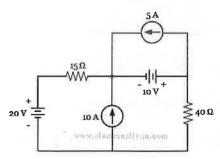


12. a) Find the Thevenin's resistance and Thevenin's voltage across the terminals A and B as shown in the fig. Draw the Thevenin's equivalent circuit.



(OR)

b) Find the voltage across the 15 ohm resistor using Superposition 13 K3 CO3 theorem.

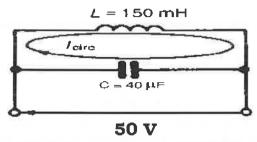


13. a) State and prove maximum power theorem.

13 K3 CO4

(OR)

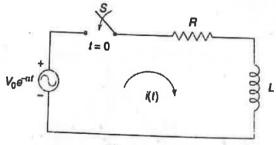
- b) A pure inductance of 150 mH is connected in parallel with a 40 μF 13 K3 CO4 capacitor across a 50 V, variable frequency supply. Determine
 - i. The resonant frequency of the circuit and
 - ii. The current circulating in the capacitor and inductance at resonance.



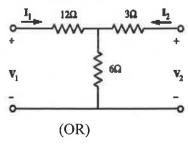
- 14. a) A resistance of 120 Ω and a capacitive reactance of 250 Ω are 13 K3 CO3 connected in series across a AC voltage source. If a current 0.9 A is flowing in the circuit find out,
 - i. Power factor
 - ii. Supply voltage
 - iii. Voltage across resistance and capacitance
 - iv. Active power and reactive power

(OR)

- b) Calculate i(t) for the series RL circuit shown in the figure.
- 13 K3 CO5

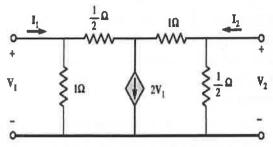


15. a) Determine the z parameters for the circuit in the following figure and then compute the current in a 4Ω load if a 24 V source is connected at the input port.



b) For the network shown in Figure determine the y parameters.

13 K3 CO5



PART - C

 $(1 \times 15 = 15 \text{ Marks})$

Q.No. Questions Marks KL CO 16. a) A series L-R-C circuit has a sinusoidal input voltage of maximum value 12 V. If inductance, L = 20 mH, resistance, $R = 80 \Omega$, and capacitance, C = 400 nF, determine,

- i. The resonant frequency
- ii. The value of the power dissipation across the capacitor at the resonant frequency
- iii. The frequency at which the power dissipation across the capacitor is a maximum, and
- iv. The value of the maximum voltage across the capacitor. (OR)
- b) Find the equivalent resistance between

i.	A and B	4	K3	CO2
ii.	B and C	4		
iii.	C and A	4		
iv.	A and N of the circuit shown in Figure.	3		

