(2b) BME

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: 12007

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
Third Semester
Biomedical Engineering
U19BM301 – ANATOMY AND HUMAN PHYSIOLOGY
(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 a cell diagram and label its organells.	2	K2	CO1
2.	What is haemostosis?	2	K3	CO1
3.	Differentiate Catabolism and Anabolism?	2	K1	CO2
4.	Discuss the types of cell division.	2	K3	CO2
5.	What is blood group? Mention its significance.	2	K2	CO3
6.	Write a note on anemia and its types.	2	K4	CO3
7.	State the role of tropomyosin in muscle contraction?	2	K1	CO4
8.	Describe the mechanism of reflex action with suitable example?	2	K2	CO4
9.	Describe the function of Endocrine Gland?	2	K1	CO5
10.	What is urinary reflex?	2	K4	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	List the significance and functions of cell with neat diagram.	13	K1	CO1
		(OR)			
	b)	What are the types of specialized tissues and explain its functions.	13	K3	CO1

12.	a)	Describe axial and appendicular skeleton. Give the characteristics of synovial joint with neat diagram.	13	K2	CO2
		(OR)			
	b)	With neat diagram explain various parts of respiratory system and the mechanism of breathing.	13	K2	CO2
13.	a)	Draw and explain the structure of heart with its conducting system.	13	K1	CO3
		(OR)			
	b)	Elaborate the functions of lymphatic system.	13	K3	CO3
14.	a)	Draw the human nervous system and describe its parts.	13	K1	CO4
		(OR)			
	b)	Name the endocrine glands present in our body and explain the functions and importance of thyroid glands.	13	K4	CO4
15.	a)	Draw and label the structure of kidney and explain the mechanisms of urine formation.	13	K5	CO5
		(OR)			
	b)	Enumerate the organs involved in the human digestive system and explain the process of digestion.	13	K4	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	With the help of diagram explain the structure and functions of the heart and Kidney.	15	K4	CO3
		(OR)			
	b)	Present a detailed Case study report on Brain and Spinal cord.	15	K5	CO4

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

Question Paper Code: 12008

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 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 (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.	How do you measure the sensitivity of an instrument? If the response of an instrument is nonlinear, would its sensitivity be of constant value? Why?	2	K3	CO1
2.	Define the term 'measurement range'. How is it related to 'dynamic range'?	2	K2	CO1
3.	Write the expression for calculating Gauge Factor of a strain gauge. Why do semiconductors have a larger gauge factor while compared to metals?	2	K2	CO2
4.	Why is the temperature of the reference junction kept under constant value in a thermocouple? State the unit of sensitivity of a thermocouple.	2	K2	CO2
5.	State the principle of measuring blood glucose using optical sensors.	2	K1	CO3
6.	What is your understanding of ionizing radiation? What are the effects of radiation on gases used in radiation detectors?	2	K1	CO3

7.	A Wheatsone bridge is depicted in Figure 1. Considering the internal resistance of the galvanometer as Rg ohms and power supply as V volts, draw the series-parallel equivalent circuit of the bridge.	2	K2	CO4

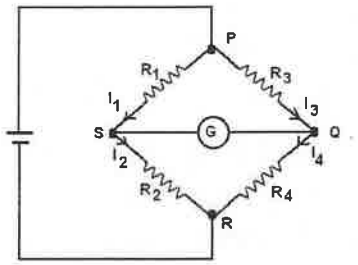

Figure 1.

8.	Draw and state the frequency response of a simple resistor - capacitor filter.	2	K1	CO4
9.	State the role of phosphor luminance while displaying waveforms on a CRT screen.	2	K1	CO5
10.	Enumerate the advantages of digital meters over analog meters.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	What are the basic blocks of a generalized instrumentation system? Sketch them and explain their function with suitable examples. How can the system be adapted to measure biosignals?	13	K2	CO1
		(OR)			
	b)	How are gross, systematic and random errors detected? Explain the effects of errors in instrumentation. Suggest at least two methods to reduce errors.	13	K2	CO1
12.	a)	A sensor is needed to measure physiologic pressure. Identify a suitable sensor that works on the inductive principle. Draw the construction of the sensor and explain its operation, characteristics, and applications.	13	K3	CO2
		(OR)			
	b)	A patient weighing system is being designed to be fixed under a bed. Identify a sensor that is most suitable to weigh loads. Explain its construction, operation and signal conditioning requirements.	13	K4	CO2
13.	a)	Explain the construction and operation of a Photo Multiplier Tube (PMT). Mention the role of focusing electrodes in the PMT.	13	K1	CO3
		(OR)			
	b)	With neat illustration, describe the working of an optical encoder and how it can be used in closed loop feedback applications.	13	K1	CO3

14.	a)	Typical ECG measurement devices face an issue with human body impedance mismatch. What is your understanding of this impedance? Explain the design of an impedance matching circuit for ECG electrodes.	13	K3	CO4
		(OR)			
	b)	Identify the AC bridges that are able to measure unknown capacitances in the range of pico farad and unknown inductances whose Q value is lesser than 10.	13	K3	CO4
15.	a)	Explain the construction and operation of a digital voltmeter. With the aid of a neat diagram, show how you would convert the digital voltmeter into a multimeter.	13	K2	CO5
		(OR)			
	b)	Identify the drawbacks of using CROs for scientific applications. Supported with an explanation of Digital Storage Oscilloscope, show how these drawbacks are overcome.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	A smart wearable has to measure the respiration rate of a human being through the temperature differences between the inhaled and exhaled air in the nostrils. Identify the sensor that can accomplish this requirement and develop a system to condition the sensor signal and display it on a screen.	15	K4	CO2
		(OR)			
	b)	A Biosignal recording setup is being developed. The characteristics of the biosignal is that is a low frequency signal (0 – 30 Hz) and the amplitude is in the order of 0-5 millivolts. The signal waveform has to be printed on a heat sensitive paper. Identify a recorder that will suit these requirements and describe its operation. Justify your selection of that recorder.	15	K4	CO5

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

Question Paper Code: 7028

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023

Third Semester

Biomedical Engineering

U19EC316 - ELECTRON DEVICES AND CIRCUITS

(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.	Can PN junction act as an electronic switch? Justify your answer.	2	K2	CO1
2.	Why laser diodes are also called as ILDs?	2	K2	CO1
3.	Can the drain and source terminals of JFET be interchanged? Justify your answer.	2	K3	CO2
4.	What are the differences between BJT and UJT?	2	K1	CO2
5.	State and define the parameters of JFET.	2	K1	CO3
6.	Draw the h-parameter equivalent circuit of CE BJT.	2	K2	CO3
7.	What is the difference between voltage amplifier and power amplifier?	2	K3	CO4
8.	What is the concept and need for tuning in amplifiers? Enumerate the different types of tuning.	2	K2	CO4
9.	Which AF oscillator uses both negative and positive feedbacks? Justify.	2	K3	CO5
10.	Mention the potential applications of crystal oscillator.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	The reverse saturation current of a silicon PN junction diode is 10μA. Compute the diode current for the forward bias voltage of 0.6V at 20°	5	K3	CO1
		ii.	Derive the expressions for diffusion and transition capacitances.	8	K2	CO1
			(OR)			
	b)	i.	Draw a full wave rectifier and explain its working principle.	6	K1	CO1
		ii.	Tabulate the differences between LED and LASER. Draw a neat schematic of semiconductor laser and explain its working.	7		
12.	a)	i.	Differentiate JFET from MOSFET. Draw the structure of JFET and explain its working.	6	K2	CO2
		ii.	In a self-biased n-channel JFET, the operating point is set to be at I_D = 1.6mA and Vds = 11V, Idss =5mA and Vgs (off) = -2.2V. Find the values of Rs and Ro if Vdd =22V.	7		
			(OR)			
	b)		Draw the structures of thyristor and IGBT. Explain their operating principles and potential applications.	13	K1	CO2
13.	a)		The hybrid parameters of a transistor used as an amplifier in the CE configuration are $h_{ie} = 850\Omega$, $h_{fe} = 40$, $h_{oe} = 83 \times 10^{-6}$ and $h_{re} = 5.4 \times 10^{-4}$. If $R_L = 4k\Omega$ and $R_S = 400\Omega$. Compute Ai, Ri, Av, Ro. Derive the expressions.	13	K3	CO3
			(OR)			
	b)		Draw the equivalent circuits of CD and CG FETs and explain them. Also derive the equations for the parameters.	13	K2	CO3
14.	a)	i.	What is the concept of Neutralization? Enumerate and explain the types of neutralization.	6	K1	CO4
		ii.	Write a technical note on types of power amplifiers.	7		
			(OR)			
	b)		Draw the circuit diagram of single tuned amplifier and explain the operating principle with necessary expressions.	13	K2	CO4
15.	a)	i.	Compare and contrast the parameters of different types of feedback typologies.	6	K1	CO5
		ii.	Design voltage series feedback amplifier and explain its operation.	7		
			(OR)			

b)	Derive the condition for oscillation in oscillators. Draw the neat circuit diagram for Wien bridge oscillator and explain its working and derive the frequency of oscillation.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	The figure 1 shows a common emitter amplifier. Determine the input resistance, ac load resistance, voltage gain and output voltage.	15	K4	CO3

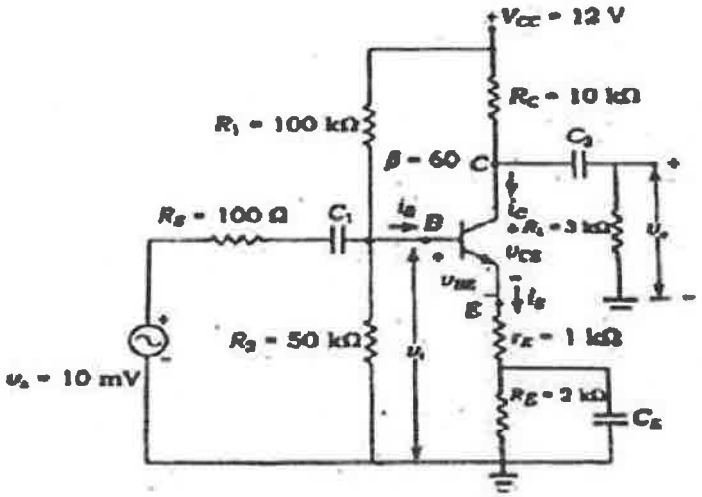

Fig 1

(OR)

b)

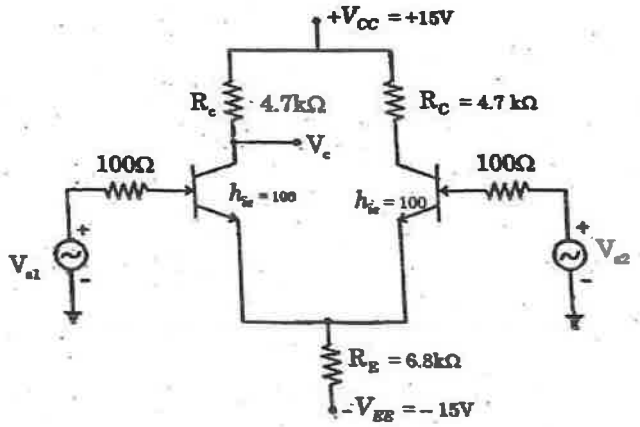

Fig 2

In fig 2, evaluate the operating point, differential gain, common mode gain, CMRR and output voltage if VS1 = 70 mV peak to peak at 1.3 kHz and VS2 = 45mV peak to peak at 1.3kHz of dual input balanced output differential amplifier. Assume hie = 2.6kΩ. | 15 | K4 | CO3 |

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

Question Paper Code: 12009

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023

Third Semester

Biomedical Engineering

U19BM303 – FUNDAMENTALS OF BIO CHEMISTRY

(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.	Determine the corresponding pKa whose concentration of a weak acid is $3.75x10^{-4}$ mol/L and pH of the weak acid is 5.67.	2	K3	CO1
2.	Mention the biomedical significance of electrolytes.	2	K2	CO1
3.	Define mutarotation.	2	K1	CO2
4.	Write about Cori cycle.	2	K2	CO2
5.	Infer how insulin reduces the output of free fatty acids.	2	K2	CO3
6.	Comment on lecithins.	2	K2	CO3
7.	Draw the structure of pyrimidine.	2	K1	CO4
8.	State the properties of amino acids.	2	K1	CO4
9.	Compare coenzyme and cofactors.	2	K2	CO5
10.	Illustrate Lineweaver-Burk plot representing competitive inhibition.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	"Water is an ideal biological solvent"- Justify the statement.	5	K2	CO1
		ii.	Derive the behavior of weak acids and buffers by Handerson-Hasselbalch equation.	8		

(OR)

	b)	i.	State the properties of biological membrane.	3	K2	CO1
		ii.	Describe the fluid mosaic model for membrane structure with suitable diagram.	10		
12.	a)	i.	Explain about the classification of carbohydrates.	7	K2	CO2
		ii.	Illustrate and write about D and L-type of isomerism found in glucose.	6		
			(OR)			
	b)		Describe the metabolic pathways involved in TCA cycle and electron transport chain.	13	K2	CO2
13.	a)		Elaborate on the classification of lipids with its biomedical significance.	13	K2	CO3
			(OR)			
	b)		Explain the significance of cholesterol and discuss about the disorders of lipid metabolism.	13	K2	CO3
14.	a)	i.	Express Chargaff's rule of base pairing.	3	K2	CO4
		ii.	Discuss about the Watson and Crick model of DNA with suitable diagram.	10		
			(OR)			
	b)		Describe in detail about the structural organization of proteins.	13	K2	CO4
15.	a)		Discuss on how Michaelis-Menten equation is used to determine Km and Vmax and add anote on its merits and demerits.	13	K2	CO5
			(OR)			
	b)		Outline about the regulation of enzyme by allosteric and covalent modification.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Discuss in brief about the biomedical importance of High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) and add a note on the risk factors involved in abnormal HDL/LDL ratio.	15	K3	CO3
		(OR)			
	b)	Elaborate on the different methods available for measurement of enzyme activity and interpretation of units.	15	K3	CO5