Ref. No.: EX/PG/BME/T/128B/2024

Master of Biomedical Engineering Examination, 2024

(1st Year, 2nd Semester)

Biosensors and Devices

Time: Three hours **Part-I** (50 Marks) **Full Marks: 100**

Use separate answer script for each part

Answer **any five** questions

Q-1)	Explain with an example how the principle of surface plasmon resonance can be used to design a biosensor.	10 Marks
Q-2)	Describe briefly urea sensor with neat sketch and explain its operation.	10 Marks
Q-3)	Describe and explain the operation of Linear Variable Differential Transformer (LVDT) used as displacement transducer. How does phase sensitive Demodulator used with LVDT operate? Explain with circuit diagram.	10 Marks
Q-4)	Mention the components of an automated biochemical analysis system and describe and explain the operation of each component briefly.	10 Marks
Q-5)	Describe a biosensor used for the detection of dopamine and explain its operation. Include sketch in your answer.	10 Marks
Q-6)	Explain the principle of Chemiluminescence and describe a biosensor based on such principle.	10 Marks
Q-7)	Explain the basic enzyme catalysis mechanism and deduce the mathematical expression for Line-Weaver Burk plot	10 Marks
Q-8)	Discuss with circuit diagrams the modes of operation of MOSFET based biosensors	10 Marks

[Turn over

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MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER – 2024

BIOSENSORS AND DEVICES Time: 3h Full Marks: 100

Part-II (50marks)

Use Separate Answer scripts for each Group

Answer any five questions.

1. Answer any ten from the following questions. *CO4*

   A. State whether the statements are true or false:

   i. Oral delivery provides faster drug action than intravenous delivery.
   ii. Prolongation of drug action can be achieved by increasing renal excretion.
   iii. In French Drogue means dry herb.
   iv. Drugs with same bioavailability value provide same drug action.
   v. EPR effect is observed in normal tissue cells.
   vi. Chemotherapeutic agents are used only to treat cancer patients
   vii. Drug metabolism often converts lipophilic chemical compounds into more readily excreted hydrophilic products.

   B. Match the following

Sr. No.	Column A	Match	Sr. No.	Column B
1	Thyroid		A	Benzyl alcohol
2	Liposome		B	Glycerin
3	Antimicrobial agent		C	Iodine
4	Brain		D	Atropin
5	Binder		E	Isoniazid
6	Iris		F	Acacia
7	Plasticizer		G	Phospholipid

1. Write the name of different types of electronic drug delivery system present and write one advantage of type of the electronic drug delivery system. Levodopa & dopamine has same action but only one is useful in treatment of brain disease-Why? *CO5, CO4*

2. Provide the reasons why bioavailability of same drug (poorly water soluble, slowly absorbed) varies from batch to batch and company to company. Write factors govern apparent volume of distribution of drug. *CO4*

3. Write a short note on rate preprogrammed drug delivery system. Differentiate between first order and zero order kinetics. *CO5, CO4*

4. Write a short note on drug absorption. Write the effect of pH partition theory on drug absorption. What is ion trapping? *CO4*

5. Differentiate between hydrodynamic pressure, hydration and hydrolysis activated DDS. What are the three basic requirements of newer drug delivery system? *CO5*

6. Define feedback regulated DDS. Propose any one feedback regulated and activation modulated DDS for insulin delivery with description. *CO5*