Master of Biomedical Engineering Examination, 2018

(1st Year, 2nd Semester)

Biosensors and Devices

Part-I

Time: Three hours Full Marks : 100

Use separate answer script for each part

Answer **any five** questions

Q-1)	Describe pH meter and explain its operation. Include neat sketch and circuit diagram in your answer	10 Marks
Q-2) (a)	Describe the method of enzyme immobilization which is used in glucose biosensor	5 Marks
Q-2) (b)	Write short note on "Linear sweep voltammetry"	5 Marks
Q-3)	Describe a biosensor with neat sketch that can be used for the detection of dopamine. Explain its principle of operation	10 Marks
Q-4)	Describe with block diagram an automated biochemical analysis system and explain the operation of each block	10 Marks
Q-5)	Describe with neat sketch the operation of Linear Variable Differential Transformer (LVDT) used as displacement transducer. How does phase sensitive Demodulator used with LVDT operate?	10 Marks
Q-6)	A single strain gauge having resistance of 120Ω is mounted on a steel cantilever beam at a distance of 0.18 m from the free end. An unknown force F is applied at the free end produces a deflection of 15 mm of the free end. The change in gauge resistance is found to be 0.25Ω. The beam is 0.25m long with a width of 20 mm and a depth of 3mm. Young's modulus for steel is 200 GN/m^2. Calculate gauge factor	10 Marks
Q-7)	Explain with neat sketches the principle of chemiluminescence to design a biosensor. Mention an example of chemiluminescent immunoassays	10 Marks
Q-8) (a)	Explain with an example the method of Infrared absorption spectroscopy. Include neat sketch in your answer	7 Marks
Q-8) (b)	Explain the working principle of solid state electrode. Mention any one of its application	3 Marks

MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER – 2018

BIOSENSORS AND DEVICES

Time: 3h Full Marks: 100

PART-II (50 marks)

Use separate answer scripts for each PART.

1. State whether the statements are true or false (Any five): 5X1=5
   i. In French Drogue means dry herb.
   ii. Intravenous delivery provides faster drug action than oral delivery.
   iii. In membrane permeation control drug delivery system drug release takes place following Fick's law of diffusion for porous polymeric membrane.
   iv. By increasing plasma protein binding one can get prolonged drug action.
   v. Rate of absorption of a drug can be improved by reducing particle size.
   vi. Bioavailability indicate only amount of free drug present in blood plasma.
   vii. Highly protein bound drugs can be removed by hemodialysis in drug poisoning.
   viii. Absorption of drug faster after taking food compare to empty stomach.

2. Answer any five questions. 5X2=10
   a. What is the major cause of individual variation in drug response?
   b. Based on route of delivery how conventional drug delivery system can be classified.
   c. Write the type of dosage forms present in conventional drug delivery system.
   d. Write attributes of drugs with high first pass metabolism.
   e. Levodopa & Dopamine has same action but only one is useful in treatment of brain disease-Why?
   f. Name two pH sensitive polymers used as drug delivery matrix.
   g. What is tortuosity?
   h. Write the factors on which drug release depend for matrix diffusion controlled drug delivery system (Monolithic).

3. Answer any three questions 3X5=15
   a. Bioavailability 5
   b. Pharmacodynamics and pharmacokinetics 5
   c. What do you mean by clearance? Write effect of pH in renal excretion of drugs. 5
   d. Differentiate between ion activated drug delivery and iontophoresis activated DDS. 5
   e. What do you mean by plasma half life? If plasma conc. Of an intravenous injection (500mg) is 10mg/L and rate of elimination is 100mg/h then find $t_{1/2}$. 5
   f. Propose a feedback regulated DDS with an example.

4. Answer any two questions. 2X10=20

a. Propose an ideal drug delivery system with the help of a diagram and one example. 10

b. Differentiate between hydrodynamic pressure, hydration and hydrolysis activated DDS. 10

c. How drugs are transported across the membranes. Write the influence of pH partition theory on drug transport across different membranes. 10

d. Define drug as per WHO. What do you mean by drug delivery system? Write the drawbacks of conventional drug delivery system. What are the three basic requirements of newer drug delivery system? 10

e. Write a short note on factors governing the apparent volume of distribution of drugs. 10