

MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2018  
DESIGN OF IMPLANTS & ARTIFICIAL ORGANS

Time: 3h

Full Marks: 100

Part-I (50 marks)

Use separate Answer script for each Part.

1. Answer any five questions.

5X1=05

- i. What do you mean by one unit of insulin
- ii. Which cells release insulin in human body?
- iii. How much (in %) hematocrit loss can cause irreversible shock?
- iv. Name one plasma expander.
- v. Name one synthetic material which can be used as oxygen carrier.
- vi. Name one xenogenic source of islets.
- vii. How much (in %) blood volume loss can cause irreversible shock?

2. Answer any five questions.

5X2=10

- i. What is Plasmaphoresis?
- ii. What is Parabolic dialysis?
- iii. What is the cut-off level for left arterial pressure for artificial heart to prevent pulmonary congestion? In this respect what is the required Aortic pressure?
- iv. Differentiate between allograft, autograft, xenograft.
- v. What are the main causes of liver failure?
- vi. Name two major bacteria's causes implant infection.
- vii. What are the materials used in hemoperfusion?

3. Answer any two questions.

2X10=20

- a. Write a short note on insulin delivery system.
- b. What are the main functions of skin? What options are present for artificial skin? Write design parameters of artificial skin graft.
- c. Write a short note on the effect of vascular system of human body on the implant material.
- d. Why implant infection is difficult to cure (by conventional antibiotic therapy)? What are the different methods present to prevent implant infection?

4. Answer any one questions :

1X15=15

- I. Write a short note on facilitated transport in liver failure. 15
- II. Write a short note on bioartificial liver. Write a short note on different artificial oxygen carrier of biological source. (5+10)
- III. Write the general parameters one should consider during design of an artificial organ. Write a short note on the designing of artificial heart or circulatory assist device. 15

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

**DESIGN OF IMPLANTS & ARTIFICIAL ORGANS**

Time: Three hours

Full Marks: 100

Use separate answer-scripts for each part

**Part – II (50 marks)**

*Answer question no. 1 and any four from the rest:*

1. Answer any ten questions:

1×10 = 10

- a. Define artificial organ.
- b. Highlight the reasons for installing artificial organ.
- c. What is myocardial Infarction how it affect heart function?
- d. How to differentiate artificial heart and ventricular assist device?
- e. Write down the basic feature of cochlear implant?
- f. How to define nose prosthesis?
- g. Write the significance of hypoxaemia and hypercapnia in assessing lungs functioning.
- h. What is End Stage Renal Disease and how it affects body function?
- i. Write the difference of peritoneal dialysis and haemodialysis.
- j. Define prosthesis and its importance.
- k. What is Stereocilia?
- l. Write the difference of wearable and implantable kidney device.
- m. Name the material used for fabrication of artificial kidney?
- n. What is the working mechanism of shoulder arthrodesis?

2. Describe in brief about the functioning of heart. Mention major heart diseases leading to use of heart implant. Describe the major components of artificial heart system and associated materials to be utilised.

2+3+5 = 10

3. Write in brief about the components of left ventricular assistive device and mention its technical difference with total artificial heart. Mention different types of ventricular assistive devices with the necessary pump specificity.

3+2+5 = 10

4. Describe the major functions of human ear. Discuss about the design and components of cochlear implant. Mention associated complications of cochlear implant.  
 $3+5+2 = 10$
5. Mention different functions of lungs and the necessity of artificial lungs. What is the use of Extracorporeal Membrane Oxygenators (ECMO)? Describe the ECMO circuit and available types.  
 $3+2+5 = 10$
6. Describe the function of Hattler Respiratory Catheter, its different components and major design considerations. Mention different materials used for fabrication of artificial lungs associated advantage and disadvantages.  
 $6+4 = 10$
7. Which kidney disease leads to kidney implant? Name the types of artificial kidney devices. Describe the principle of implantable artificial kidney, its components and functioning steps.  
 $2+2+6 = 10$
8. Define prosthesis and mention the different components used in shoulder prosthesis, hip prosthesis and knee prosthesis.