Ref. No. : Ex/PG/BME/T/127B/2024

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

DESIGN OF IMPLANTS & ARTIFICIAL ORGANS

Time: 3h Full Marks: 100

Answer a total of **100** marks from the followings questions

1. Answer the questions. 10X2=20
   i. Name two xenogenic sources of islets.
   ii. Name material for finger joint and state which type of joint it is.
   iii. What do you mean by Sieving Co-efficient?
   iv. What is the cut-off molecular weight as per middle molecular theory? What is the optimum pore size range to accommodate osteons?
   v. Name one metal and polymer which find application in artificial heart.
   vi. Name one synthetic material which can be used as oxygen carrier and one plasma extender.
   vii. Differentiate between Autograft, Allograft and Xenograft.
   viii. What is the cut-off level for left arterial pressure for artificial heart to prevent pulmonary congestion? In this respect what is the required Aoatic pressure?
   ix. Which cells release insulin and glucagon?
   x. What is Plural effusion?
   xi. When kidney problem detected, patient is left with how much kidney function? Is there any change in kidney function with age?

2. Answer the questions. 10X10=100
   i. What is the membrane materials used for fabrication of hemodialysis membrane? How urea excreation rate can be increased during dialysis. (5+5) **CO5**
   ii. What are the steps of implant design? Write the reasons for premature failure of Hip joint. What do you mean by one unit of insulin? (5+4+1) **CO2**
   iii. Write a short note on different artificial oxygen carrier of biological source. 10 **CO3**
   iv. Write a short note on artificial lung including heart-lung machine. 10 **CO5**
   v. Find the urea conc. in blood if BUN is 30g/dL.? Write the reasons for kidney failure. Write a short note on artificial wearable kidney. (4+2+4) **CO1, CO5**
   vi. 'Shoulder joint has highest range of motion'-explain. Hip joint and Shoulder joint both are ball & socket joint- how their stability varies-explain. (5+5) **CO4**
   vii. Write a short note on different external methods present to treat patients with kidney failure along with mechanism wherever applicable. 10 **CO5**
   viii. Name the different internal dialysis systems are present? Write the advantage and disadvantage of hemodialysis and peritoneal dialysis. Write a short note on peritoneal dialysis. 10 **CO5**
   ix. Classify artificial total knee joint based on ligament stability. Name one polymer, one ceramic and one metal/alloy find application in total joint replacement. Write their application and properties. Write the materials used in 'skin equivalent' along with justifying their relative position. 3+ (1+3) +3 **CO4, CO5**
   x. What is Plasmaphoresis? When does it used? Write the main functions of normal Liver? What is cross dialysis? What are their advantage and disadvantage? What are the challenges in fabricating bioartificial lever? 3+2+3+2 **CO1, CO5**