

GANPAT UNIVERSITY

B. Tech. Semester: VIII (Biomedical & Instrumentation) Engineering

Regular Examination April – June 2017

2BM803 Transportation Phenomena in Living Systems

Time: 3 Hours

Total Marks: 70

- Instruction:**
1. Write each section in separate answer book.
 2. Answer should be brief and to the point.
 3. Figure to the right indicates marks.
 4. Assume suitable data, if necessary.

Section - I

- Que. – 1 Answer the following questions: 12**
- (a) What is the insensate loss of moisture from skin? Why is the heat of vaporization more at body temperature? Also give a mathematical proof. **04**
 - (b) Draw the structure of blood perfused tissue and explain in detail. Show the temperature equilibration between blood and tissue. **04**
 - (c) What are the assumptions of Pennes bioheat model? Write the standard thermal diffusion equation for pennes model and explain all terminology. **04**

OR

- Que. – 1 Answer the following questions: 12**
- (a) Which are the sub volumes of Chen – Holmes continuum model? Draw the schematic representation of it and explain. **04**
 - (b) Draw the schematic of artery and vein pair in peripheral skin layer. Enlist the assumptions of Weinbaum – Jiji – Lemons model. **04**
 - (c) What is a transport system? What are the features of transport system? **04**

- Que. – 2 Answer the following questions: 11**
- (a) Define long wave and short wave radiation? **02**
 - (b) Describe the concept of mass transfer of ions and water from the tubules of the nephron. **04**
 - (c) Enlist the different ways through which human body can maintain the thermal balance. **05**

OR

- Que. – 2 Answer the following questions: 11**
- (a) Define “Dialysis”. Draw the functional block diagram of dialysis system. Explain in detail. **04**
 - (b) Explain the concept of mass transfer process across the systemic capillaries. Show the relationship between inlet and outlet flow of liquids across the capillaries for constant osmotic pressure and decreasing hydrostatic pressure. **04**

(c) Fill in the blanks:

03

- i) _____ percentage content of oxygen in the expired air and _____ percentage content of oxygen in atmospheric air.
- ii) The temperature of body is regulated by natural neural feedback mechanism which operates primarily through _____.
- iii) The capillary structure has a diameter of _____ micrometer and the largest artery has a diameter of _____.

Que. - 3

Answer the following questions:

12

- (a) How heat transfer takes place through radiation in human body? Calculate the heat transfer through radiation for the body area 1.9 m^2 , Hot surface temperature = 307 kelvin, Cold surface temperature = 298 kelvin. 05
- (b) Enlist the advantages and disadvantages of open loop and closed loop circulatory system. 04
- (c) What is dead space and alveolar space in human lungs? Which one is not take part in the gas exchange process? 03

Section - II

Que. - 4

Answer the following questions:

12

- (a) What are the basic mechanisms for transport through cell membrane? 04
- (b) What is facilitated diffusion? Explain it for cell membrane.? 05
- (c) Give the difference between natural and forced convection. 03

OR

Que. - 4

- (a) Write an equation for mass transfer coefficient in terms of resistance to mass transfer. 12
- (b) What decides the value of average heat transfer coefficient? 05
- (c) Define i) Dialysance ii) Osmosis iii) Mass transfer 03

Que. - 5

Answer the following questions:

11

- (a) What is hemofiltration? Write features of hemofiltration. 05
- (b) Define exocytosis. Explain it with some examples. 03
- (c) Give the name of molecules which diffuses through cell membrane. 03

OR

Que. - 5

Answer the following questions:

11

- (a) Write short note on kidney structure and function. 05
- (b) Enlist the actively secreted substances through kidneys. 02
- (c) Write short note on cell membrane structure and composition. 04

Que. - 6

Answer the following questions:

12

- (a) Give Biomedical applications of heat Convection and heat radiation. 05
- (b) Describe the design considerations for the artificial kidney. 05
- (c) Answer the multiple choice questions 02
 - i) Water passes into and out of cells through the _____.
 - a. phospholipid bilayer
 - b. water carrier proteins
 - c. water receptor proteins
 - d. cell-recognition proteins
 - ii) If someone sitting at the other end of a restaurant smokes a cigarette, you may still breathe in some of the smoke. The movement of smoke through the air of the restaurant is an example of what type of transport?
 - a. osmosis
 - b. diffusion
 - c. facilitated diffusion
 - d. active transport

END OF PAPER