

Student Exam No:

GANPAT UNIVERSITY

B.Tech. Semester V (BM&I) Regular Examinations Nov/ Dec 2013

2BM 505 Cardiovascular System and Dynamics

Time:- 3 Hours

Marks:- 70

Instructions:

1. Answer to the questions must be written in separate answer books.
2. Figure to the right indicate marks.
3. Assume data, if needed.
4. Conventional terms / notations are used.
5. All the questions are compulsory.

SECTION-I

Q.1

(a) Define blood and write a short note on 'Blood Hematology'. [6]

(b) Derive the expression for Newton's law of Viscosity. [6]

OR

Q.1

(a) Write a short note on Pulsatile flow in elastic channel. [3]

(b) What do you understand by Constitutive modelling? Give and explain "Power Law Constitutive model for Blood". [5]

(c) Define the following terms: [4]

- i) Rigidity
- ii) Pseudo plasticity
- iii) Deformation
- iv) Non Newtonian fluid

Q.2

(a) Draw and explain the pressure variations in the systemic circulation. [5]

(b) Write a short note on Wind kessel model. [4]

(c) Discuss Strouhal number. [2]

OR

Q.2

(a) Derive the generalized Bernoulli's equation for pressure and flow in blood vessel. Explain its physiological and clinical relevance. [6]

(b) What is Reynolds number? Calculate the Reynolds number in human aorta at rest with a cardiac output of 5 litre/min. Based on the Reynolds number, define the type of blood flow. (Given: Diameter of aorta is 3 cm, blood density is 1.06 gm/cm^3 and viscosity is 0.035 Pa.s) [5]

Q.3 Answer the following:

(a) Describe the Poiseuille's law and its significance in different blood vessels. [6]

(b) What is cardiovascular systems & dynamics? Discuss the scope of the subject. And give the applications of this subject. [6]

SECTION-II

Q.4

(a) What is laminar flow and turbulent flow? How does laminar flow turn to turbulent flow? Explain the importance of turbulent flow. [6]

(b) Consider a red blood cell of maximum dimension $7.5 \mu\text{m}$ and a volume of $90 \mu\text{m}^3$. What should be the hematocrit of blood, if each cell were completely free to spin around itself in any direction without interference from a neighboring cell? Assume a face centered cubic packing factor. [4]

(c) Define the following terms. [2]

- i) Newtonian fluid ii) Mechanics

OR

Q.4

(a) Describe the mechanical event in cardiac cycle. Correlate the electrical and mechanical events in the heart. [8]

(b) Write a short note on hemodynamic in vascular channel. [4]

Q.5

(a) For cardiovascular system discuss the laws of conservation of mass, energy and momentum. [6]

(b) Describe the Compliance and Elastance in reference to artificial blood vessel graft. [5]

OR

Q.5

(a) Calculate the Kinetic Reynold's number at the root of the aorta for a 100 beats per minute heart rate. [5]

(b) Explain the following terms: [6]

- i. Viscosity
- ii. Bingham Plasticity
- iii. Dicrotic notch

Q.6 Answer the following:

(a) For one complete cardiac cycle of heart explain electrical impulse conduction system with diagram. [6]

(b) Define the stenosis. Explain with diagram the effect of Mitral stenosis on P-V loop of left ventricle. [6]

-----END OF PAPER-----