

Code No: RR311101

Set No.1

III B.Tech. I Semester Supplementary Examinations, May -2005
BIO-FLUIDS AND MECHANICS
(Bio-Medical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Describe the non-Newtonian nature of whole blood.
(b) How is the blood viscosity determined?
2. (a) How is the blood viscosity determined?
(b) What are the factors on which the blood viscosity depends?
3. (a) Explain the blood viscosity measurement using a viscometer.
(b) Describe in detail the parameters which affect the blood viscosity.
4. Explain the Maxwell, voigt and Kelvin models of viscoelasticity.
5. (a) Explain the mechanical properties of arteries, arterioles and give their significance.
(b) Compare the mechanical properties of the arteries and veins.
(c) Write short notes on arteriosclerosis.
6. (a) Draw and label a spirogram.
(b) Explain the diagnostic importance of lung ventilation parameters.
(c) Describe the process of airway mechanics.
7. (a) Explain the structure and properties of tendons.
(b) Describe structural properties of ligaments and effect of injuries on locomotion.
8. Describe various joints in human body and role of articular cartilage in smooth locomotion.

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1. (a) What are the factors which determine the resistance to flow?
(b) Given the radius of aorta as $1.3 \times 10^{-2}m$, determine the resistance and pressure drop over a 0.2m distance, if the flow rate is $10^{-4}m^3/s$.
2. (a) How is the blood viscosity determined?
(b) What are the factors on which the blood viscosity depends?
3. (a) Explain the inverse effect of FAHRAEUS-LINDQUIST effect.
(b) How the R.B.C moves in a tightly fitted tube whose diameter is less than R.B.C.
4. (a) Describe the utility of viscoelastic models.
(b) Explain the instrument used to test a bioviscoelastic fluid.
5. (a) Explain why the heamatocrit varies from vessel to vessel.
(b) Describe the mechanical properties of blood vessels.
(c) Give a brief note on prosthetic heart valves.
6. (a) With the help of a P-V curve of a lung, explain the normal breathing mechanism.
(b) What are the lung mechanical parameters? Differentiate normal and abnormal respiratory states.
7. (a) Describe briefly about the Viscoelasticity of soft tissues.
(b) Justify the viscoelastic nature of the bone.
8. Describe the mechanics of elbow with necessary diagrams.

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1. Write short notes on:
 - (a) Hookes law
 - (b) Newtonian and non Newtonian fluids
 - (c) Constitutive equation.
2.
 - (a) How is the blood viscosity determined?
 - (b) What are the factors on which the blood viscosity depends?
3.
 - (a) Write notes on Blood viscosity variation.
 - (b) What are Fahraeus-Lindquist and inverse effects? Describe the nature of red blood cells in tightly fitting tubes with illustrations.
4.
 - (a) Describe the utility of viscoelastic models.
 - (b) Explain the instrument used to test a bioviscoelastic fluid.
5.
 - (a) Explain the working of any prosthetic heart valve.
 - (b) Describe the operation of any one mechanical heart valve.
 - (c) Compare the performance features of mechanical and tissue heart valves.
6.
 - (a) With the help of a P-V curve of a lung, explain the normal breathing mechanism.
 - (b) What are the lung mechanical parameters? Differentiate normal and abnormal respiratory states.
7.
 - (a) Describe briefly about the Viscoelasticity of soft tissues.
 - (b) Justify the viscoelastic nature of the bone.
8.
 - (a) Draw and explain the stress-strain curve of a bone.
 - (b) Draw and explain the stress-strain diagram of a human cortical bone.

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1. Explain Vascular tree with illustrations. Describe the relationship of diameter, velocity and pressure of blood in blood vessels.
2. Write notes on:
 - (a) Chemical properties of blood.
 - (b) Mention some important problems associated with extracorporeal blood flow.
 - (c) Blood viscosity variation?
3.
 - (a) Elaborate the role of capillaries in blood flow.
 - (b) What is plasma skimming.
 - (c) Explain FAHRAEUS-LINDQUIST effect.
4.
 - (a) Enumerate various viscoelastic models?
 - (b) Explain the bioviscoelastic fluids with various models in detail.
5. Enumerate the mechanical properties of blood capillaries and veins in detail.
6.
 - (a) With the help of a P-V curve of a lung, explain the normal breathing mechanism.
 - (b) What are the lung mechanical parameters? Differentiate normal and abnormal respiratory states.
7.
 - (a) Describe briefly about the Viscoelasticity of soft tissues.
 - (b) Justify the viscoelastic nature of the bone.
8.
 - (a) Discuss the viscoelastic properties of synovial fluid.
 - (b) Describe the experimental set up to evaluate the friction coefficient between two articular cartilage surfaces.
