BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
M.E. 1ST SEMESTER (EM) FINAL EXAMINATIONS, 2011
Biomechanics – I (AM – 920)

Full Marks : 70 **Time : 3 hrs**

Answer any FIVE questions, taking at least TWO from each GROUP

Answer for both the groups to be given in same answer-script

GROUP 'A'

1. State assumptions and derive an expression for pulse-wave propagation velocity through artery. **[4 + 10]**

2. a) Briefly describe the structure and function of the vertebral column.

b) Calculate the force exerted by the lumbo-sacral dics and the force (F_e) exerted by the erector spined muscles while bending. Assume that F_e makes angle of 15° with the longitudinal axis of the spinal column and the lumbo-sacral angle is 30°, weight of the person (W) = 700 N, weight of the trunk = 0.4W and weight of arm and head together = 0.2W. **[7 + 7]**

3. a) Find out the responses of a fluid filled catheter to a step change in pressure.

b) Indicate the factors on which the catheter response depends. **[10 + 4]**

4. a) Determine the hip joint forces during walking and standing on one foot.

b) Explain how use of cane helps recovery after hip surgery. **[8 + 6]**

GROUP 'B'

5. a) Draw the cyclic variation of left ventricular and aortic pressure in conjunction with the recording of ECG and phono-cardiogram. Explain all salient features.

b) Indicate the steps followed in the static analysis of stress in the mitral valve, using sinusoidal load function. **[7 + 7]**

6. **a)** Explain isotonic and isometric contraction of muscle and indicate the condition of Tetanus.

b) Estimate the power developed by the heart during (i) activity and (ii) at rest. **[7 + 7]**

7. **a)** Discuss different characteristics of soft tissues.

b) Using Fung's assumption derive a constitutive relationship between stress and strain of soft tissue. **[7 + 7]**

8. Write notes on the following:

a) Type of bone joints and their movements.

b) Contractile mechanism of skeletal muscles. **[7 + 7]**

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