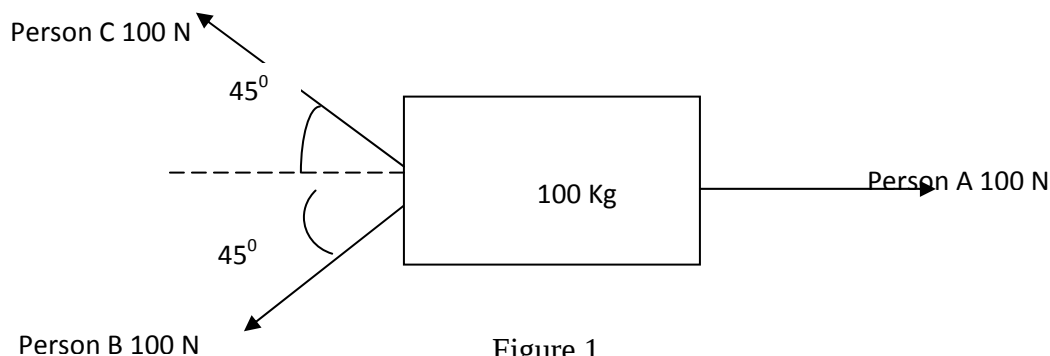


B.Sc. PROSTHETICS AND ORTHOTICS**FIRST YEAR****PAPER VI – BIOMECHANICS - I****Q.P. Code: 802406****Time: Three Hours****Maximum : 100 Marks****Answer All questions****I. Elaborate on:****(3 x 10 = 30)**

1. What is a joint? Discuss structural and functional classification of a Bone.
2. Explain with the help of a diagram, kinematics of hip joint during one gait cycle.
3. How many rockers are present in one gait cycle? Explain them with the help of a labeled range of motion graph.

II. Write notes on:**(8 x 5 = 40)**

1. Why is skin preparation needed before you record surface EMG?
2. What is whip? Discuss the reasons for whip in trans femoral prosthesis user.
3. Discuss third law of motion by citing an example?
4. Draw a labeled diagram and explain load deformation curve for connective tissue.
5. What do you understand by eccentric contraction of a muscle? Explain with an example.
6. Explain stress relaxation with an example?
7. Define degree of freedom? How many degrees of freedom does hip joint have? Show them with the help of diagram.
8. A block of mass 100 Kg in weight, tied to a string is pulled by three persons A, B and C in the directions as shown in the fig 1. What will be the resultant force acting on the mass and what will be its direction?

**Figure 1**

III. Short answers on:

(10 x 3 = 30)

1. Define Energy. What is its SI unit and dimension?
2. Is velocity a vector or a scalar quantity? Justify with an example.
3. What is osteokinematics?
4. What is the advantage of instrumental gait analysis over conventional video gait analysis?
5. Write short notes on biomechanics of Symes prosthesis. Explain with the help of a diagram.
6. If a trans femoral prosthetic user exerts 750 N against the ground during push off phase of the gait. How much force will the ground exerts on the person? Assume the weight and height is 62Kg and 160cm respectively.
7. Consider the partial knee illustrated in the figure 2. The forces applied by quadriceps $F_Q = 10$ N and patella tendon $F_p = 10$ N respectively. Calculate the magnitude and direction of the resultant force on the patella due to forces applied by quadriceps and patella tendon.



Figure 2

8. In which plane will you record movement of medial and lateral rotation of pelvis? Draw the corresponding plane showing this movement.
9. What do you mean by concurrent forces? Comment on the direction of resultant force if two concurrent forces are acting on a object in opposite direction?
10. Name the different arches of foot?

BACHELOR IN PROSTHETICS AND ORTHOTICS
FIRST YEAR
PAPER VI – BIOMECHANICS - I

Q.P. Code: 802406

Time: Three hours

Maximum : 100 Marks

Answer All questions

I. Elaborate on:

(3 x 10 = 30)

1. What are connective tissues? Discuss their mechanical properties?
2. Explain with the help of a diagram, kinematics of ankle joint during one gait cycle.
3. How many arches are present in the foot? What are their functions?

II. Write notes on:

(8 x 5 = 40)

1. Discuss advantages and disadvantages of surface EMG recording over needle EMG?
2. What is vaulting? Discuss the reasons for vaulting in a transfemoral prosthesis user.
3. Discuss first law of motion by citing an example?
4. Draw a labeled diagram and explain force elongation curve for connective tissue.
5. What do you understand by concentric contraction of a muscle? Explain with an example.
6. Explain creep with an example?
7. Define degree of freedom? How many degrees of freedom does hand have? Show them with the help of diagram.
8. Consider a weight lifter performing an exercise (Fig. 1) to strengthen the biceps muscle, which is located at a distance of $a=1$ cm from elbow joint. Assume that combined center of mass of hand and weight is 100 N and is located at a distance of $b=7.5$ cm from the elbow joint O. If the hand is held in horizontal position as shown in the figure. Calculate the mechanical advantage if it is class 2 lever system. What will be the direction of movement of the hand?

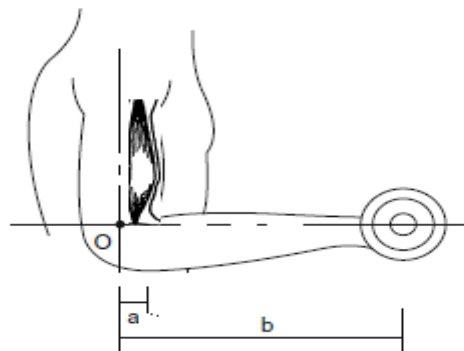


Figure 1

III. Short answers on:

(10 x 3 = 30)

1. Define work. What is its SI unit and dimension?
2. Is acceleration a vector or a scalar quantity? Justify with an example.
3. What is hypomobility of a joint?
4. What is the purpose of recording EMG while performing gait analysis?
5. What are the different types of foot amputations? Briefly describe the biomechanics of a prosthesis given for mid foot amputation? Draw diagram.
6. Consider the partial knee illustrated in the figure 2. The forces applied by quadriceps $F_Q = 12\text{ N}$ and patella tendon $F_p = 5\text{ N}$ respectively. Calculate the magnitude and direction of the resultant force on the patella due to forces applied by quadriceps and patella tendon.



Figure 2

7. If a trans tibial prosthetic user exerts 700 N against the ground during push off phase of the gait, how much force will the ground exert on the person? Assume the weight and height is 63Kg and 165cm respectively.
8. In which plane will you record movement of abduction and adduction of shoulder or leg? Draw the corresponding plane showing this movement.
9. What do you mean by concurrent forces?
10. Why do you need conductive gel for surface EMG recording?
