Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VII (BM & I) Engineering

Regular Examination Nov-Dec 2016

2BM702: Biomechanics

Time: 3 Hours **Total Marks: 70**

Instruction:
1. This Question paper has two sections. Attempt each section in separate answer book.
2. Figures on right indicate marks.
3. Be precise and to the point in answering the descriptive questions.
4. Assume suitable data if necessary

Section - I

Que. – 1 [12]

(a) Describe Force → Velocity relationship for muscular contraction cycle in detail with neat diagram. 5

(b) What is the main difference between fast twitch muscles and slow twitch muscle? Draw the time v/s tension diagram for fast twitch and slow twitch muscles. 3

(c) What are major assumptions made while performing bio-mechanical analysis of any joint? 4

OR

Que. – 1 [12]

(a) What differences in muscles characteristics is caused when muscles are presented with repetitive load in compare to that of sudden and acute load? Describe the graph representing likelihood of injury. 4

(b) Write short note on classification of various joints of human body. 4

(c) Discuss the difference found among load acting on shoulder joint by comparing normal day to day activity in regards to special skilled activities. 4

Que. – 2 [11]

(a) Describe various mechanical loads acting on Knee Joint. 3

(b) Compare the structure and function of Hip joint with shoulder joint. Discuss advantages and disadvantages on biomechanical point of perspective. 4

(c) How much compression acts on the patella-femoral joint (Figure – 1) when the quadriceps exerts 300 N of tension and the angle between the quadriceps and the patellar tendon is (a) 160° and (b) 90°? 4

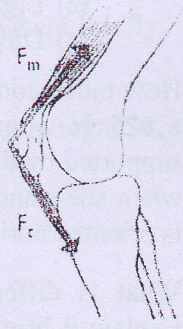

Figure - 1

OR

Que. – 2 [11]

(a) Enlist and explain briefly major muscles supporting the movement at Hip joint. 3

(b) Justify the statement "The compressive force acting at the hip joint is higher than compression at the knee joint despite the fact that the knee supports more body weight during stance than does the hip joint. 4

(c) How much force must be produced by the brachioradialis and biceps (Fm) to maintain the 15 N forearm and hand in the position shown below, given moment arms of 5 cm for the muscles and 15 cm for the forearm/hand weight? What is the magnitude of the joint reaction force? 4

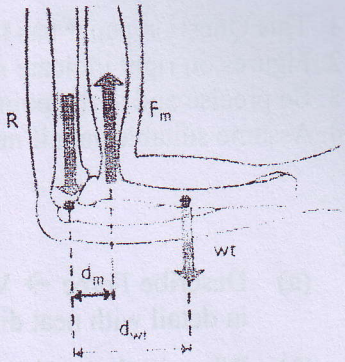

Figure -2

Que. – 3 [12]

(a) Choose the correct answer for given multiple choice questions 5

1. If all the forces in a system passes through the same point, then it is called a _____ force system
   (a) Coplanar (b) Concurrent
   (c) Collinear (d) None of the above
2. Muscle is _____ if it controls movement increasing its length.
   (a) Agonist (b) Antagonist
   (c) Passive muscle (d) None of the above
3. The angle of femur neck with vertical is greater than 125 degrees in _____ and is less than 125 degrees for _____
   (a) Valgus, Varus (b) Varus, Valgus
   (c) Valgovarus, Varovalgus (d) Varovalgus, Valgovarus
4. A man with weak hip abductor muscles or painful hip joint usually lean _____ the weaker side.
   (a) Away (b) Towards
   (c) Oscillates (d) None of the above
5. Radius is connected to Ulna bone by _____
   (a) Ligaments (b) Muscles
   (c) Direct bone – bone contact (d) None of the above

(b) How much compressive stress is present on the L1, L2 vertebral disc of a 625 N woman, given that approximately 45% of body weight is supported by the disc (a) when she stands in anatomical position and (b) when she stands erect holding a 222 N suitcase? (Assume that the disc is oriented horizontally and that its surface area is 20 cm^2.) 4

(c) What is difference between mechanical axis and anatomical axis? Explain it briefly with neat diagram and also state the ideal difference between mechanical axis and anatomical axis for human body. 3

Section – II

Que. – 4 [12]

(a) Define following terms: 5
(1) Gait (2) Gait Cycle (3) Step Length (4) Stride Length
(5) Cadance

(b) Which parameters are involved in analysis of Gait cycle? Explain them briefly. 4

(c) Classify the lever system of human body and explain it briefly. 3

OR

Que. – 4 [12]

(a) Define stability and balance in regards to human body. 3

(b) What is resultant torque? Illustrate resultant joint torques acting on human body. 4

(c) Which types of motions performed during swing phase? 3

(d) What is mechanical advantage? Also write the mathematical formula for it. 1

(e) Triceps Surae is an example of _____ Lever. 1

Que. – 5 [11]

(a) Describe various directions of human body in respect to anatomical reference position. 4

(b) Classify and explain briefly external forces acting on human body. 4

(c) What is difference between qualitative and quantitative study in biomechanics? Explain giving suitable example. 3

OR

Que. – 5 [11]

(a) Describe and explain anatomical reference planes with neat representative diagram. 4

(b) Describe the various forms of mechanical load acting on human body. 4

(c) What is biomechanics? Enlist fundamentals research domains in biomechanics and explain any one briefly giving suitable example. 3

Que. – 6 [12]

(a) Enlist the names of gravity dependent machines. 3

(b) What are common gait abnormalities? Explain them briefly. 4

(c) Describe the various events of stance phase. 3

(d) When a force is applied at _____degree to a segment, the moment arm and lever arm are equivalent. 1

(e) What is the color of synovial fluid? 1

END OF PAPER