Sr. No 002309

January 2023

B.Tech (CIVIL) Re-Appear 3rd Sem.,

Engineering Mechanics (ESC-202)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) State the Laws of friction. (1.5)

(b) State Lamis Theorem. (1.5)

(c) Differentiate between centroid and centre of gravity. (1.5)

(d) Define a Free Body Diagram. Give two examples. (1.5)

(e) Write impulse momentum equation. (1.5)

(f) State the conditions for equilibrium of a rigid body in three dimensions (1.5)

(g) Why static coefficient of friction is always greater than kinetic coefficient of friction? (1.5)

(h) What are the conditions of equilibrium for concurrent, parallel and general force system? (1.5)

(i) Define D'Alembert Principle. (1.5)

(j) Explain briefly about work-energy method. (1.5)

PART -B

Q2 Find the least horizontal force 'P' to start motion of any part of the system of three blocks resting upon one another as shown in the Figure 1 . The weights of the blocks are A = 3000N, B = 1000N, C = 2000N. Between A and B, $\mu = 0.3$, between B and C, $\mu = 0.2$ and between C and the ground, $\mu = 0.1$. (15)

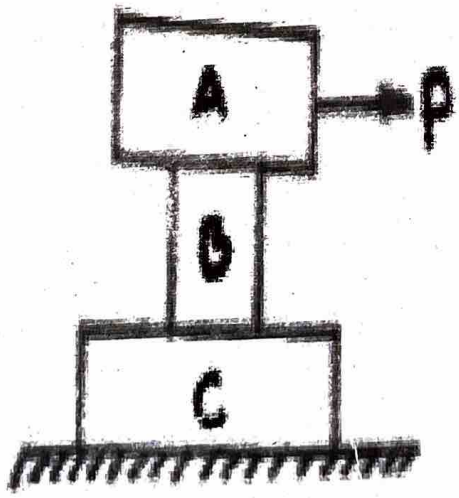

Figure 1

Q3 The forces $\mathbf{F}_1$, $\mathbf{F}_2$, and $\mathbf{F}_3$, all of which act on point A of the bracket, are specified in three different ways shown in Figure 2. Determine the x and y scalar components of each of the three forces. (15,

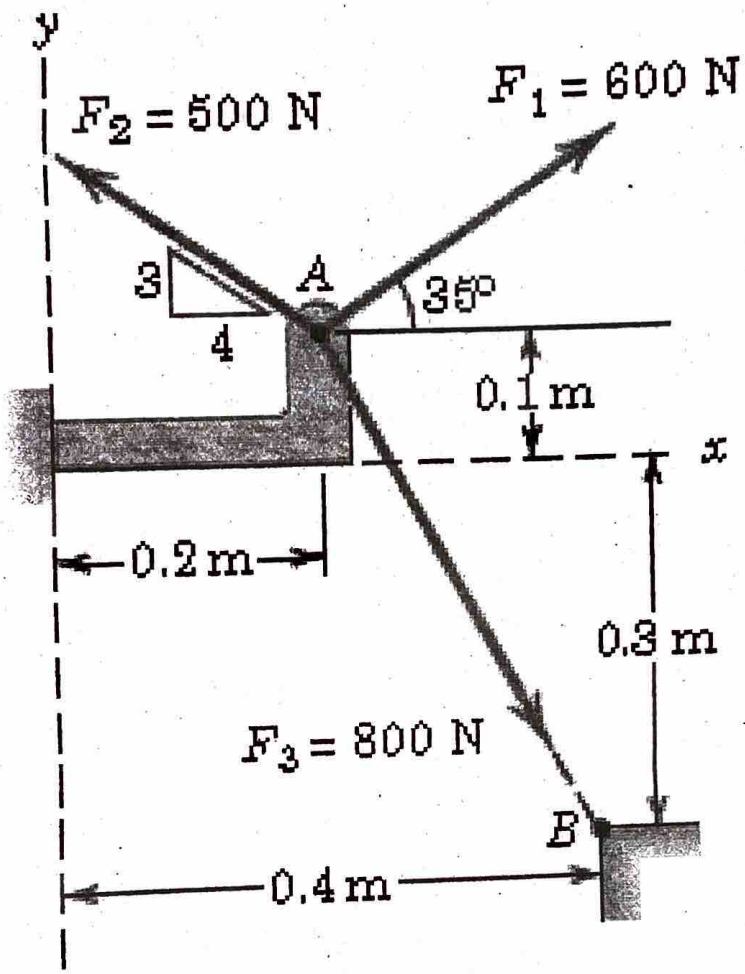

Figure 2

Q4 What is a force? Give classifications of system of forces. (15)

Determine the forces S1and S2 induced in the bars AC and BC in Figure 3, due to the action of the horizontal applied load at C. The bars are hinged together at C and to the foundation at A and B.

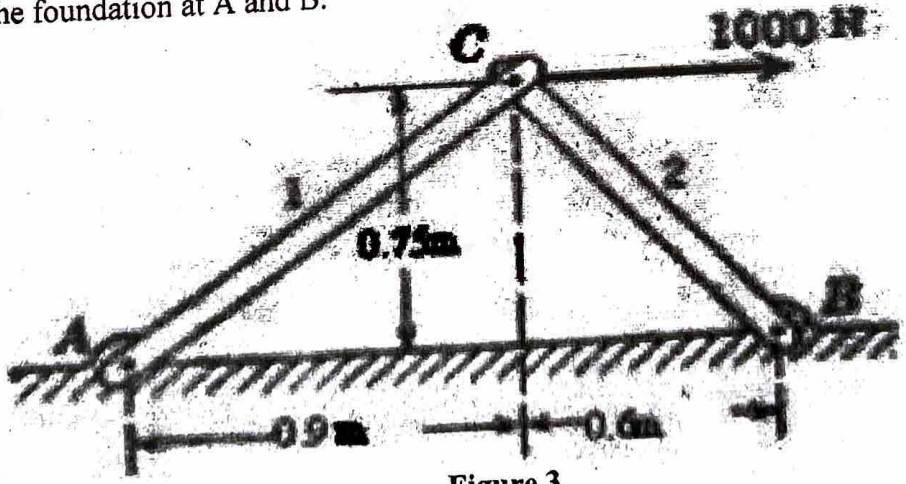

Figure 3

Q5 (a) From the first principle find the centroid of a right angle triangle of height h and breadth b. (8)

(b) Find the centroid of the area shown in Figure 4 . All dimensions are in cm. (7)

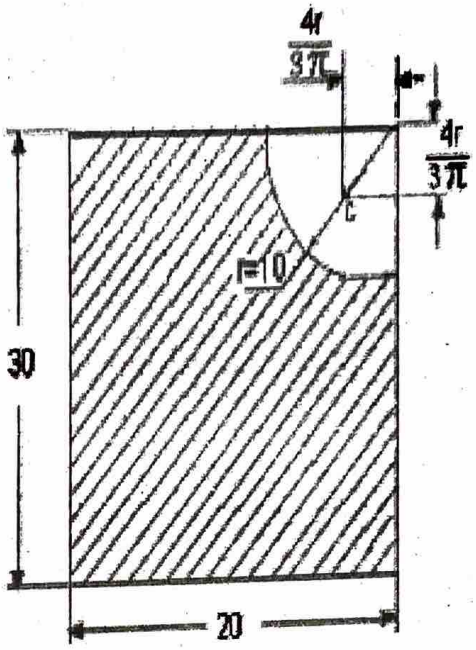

Figure 4

Q6 What are the parameters that define rectilinear motion? State the relationship between these parameters. (15)

A 320 KN gain fires a 6 KN shell horizontally with a velocity of 300m/s. What is the recoil velocity of the gun? The recoil is overcome by applying an average fore of 500 KN. What is the distance travelled by the gun and the time taken?

Q7 (a) A car travelling at a speed of v= 60 kmph is braked and comes to rest in 8sec after the brakes are applied. Find the minimum coefficient of friction between the wheels and the road. (8)

(b) A train of 1500kN weight develops a power of 35kW while moving down a slope of 1 in 150 at a uniform speed of 18kmph. What power is required if the train is to go up the slope with the same speed? (7)

****