Engineering Mechanics

(For Section CS-1)

First Assignment (2015-16)

(Last Date of Submission: 05-02-16)

1. A force of 200 KN is acting at A. Resolve the force along two members AB and AC. Refer figure:1

2. A load is lifted in vertical direction with a force of 40 KN, applying by two cables passing over smooth pulleys. Find the tension T_1 if T_2 is to be minimum. What is the distance between two pulleys for this condition? Refer figure:2

3. Determine the angle Ɵ for strut AB, so that 400 N horizontal force has a component of 500 N acting from A to C. Also find component along member AB. Refer figure:3

4. Determine: (a) The required tension in cable BC if the resultant of three forces at B is to be vertical. (b) The corresponding magnitude of resultant. Refer figure:4

5. The striker of carom board laying on the board is being pulled by four players as shown in figure: 5. The players are sitting exactly at the centre of the four sides. Determine the resultant of forces in magnitude and direction.

6. A car is pulled by means of two ropes as shown in figure:6 The tension in one rope is P=2.6 KN. If the resultant of two forces applied at O is directed along the X- axis of the car. Find the tension in the other rope and the magnitude of the resultant.

7. Find the angle of tilt Ɵ with horizontal so that the contact force at B will be one-half at A.

8. Determine the horizontal distance x of which a 5 m long inextensible string holding a roller of weight 3 KN can be pulled before the string breaks. The string can withstand a maximum force of 6 KN as show in figure:8. Determine also the required force F.

9. The 30 Kg collar may slide on frictionless vertical rod and is connected to a 34 Kg counter-weight. Find the value of 'h' for which the system is in equilibrium. Refer figure:9

10. Two cylinders each of diameter 100 mm and each weighing 200 N are placed as shown in figure:10, assuming that all the contact surfaces are smooth, find the reactions at A,B and C.

11. Two spheres A and B of weight 1000 N and 750 N, respectively are kept as shown in the figure:11. Determine the reactions at all contact points. Radius of A = 400 mm and radius of B =300 mm.

12. Determine the reactions at points of contact 1,2 and 3 as shown in the figure:12.

13. Two smooth circular cylinder of weight W = 500 N each and radius r =150mm are connected at their centre by a string of length L =400 mm and rest upon a horizontal plane supporting above them a third cylinder of weight 1000 N and radius 150 mm as

shown in figure:13. Find the tension in the string and pressure at the point of contact D and E.

14. Three cylinders are piled up in a rectangular channel as shown in figure:14. Determine the reactions at point 6 between the cylinders A and the vertical wall of the channel. Mass of cylinders A,B and C are 15 Kg, 40Kg and 20 kg respectively. Radius of cylinders A, B and C is 4 cm, 6 cm and 5 cm respectively.

15. Two bodies weighing 150 N and 200 N respectively rest on a cylinder and are connected by a rope as shown in figure: 15. Find the reaction of cylinder on the bodies, the tension in rope and angle Θ assume all surface to be smooth.

FIGURE:1

FIGURE: 2

FIGURE: 3

FIGURE: 4

FIGURE: 5

Top View

P = 2.6 kN

32°

28°

O

Q

FIGURE: 6

B

A

45°

45°

θ

FIGURE: 7

O

5 m

5 m

θ

F

3 kN

x

FIGURE: 8

400 mm

D

B

Rod

h

30 kg coller

C = 34 kg

A

FIGURE: 9

150 mm

C

A

B   30°

FIGURE: 10

700 mm

A

3

4

B

1

2

60°

FIGURE: 11

$W_A = 1 \, kg \quad r_A = 1 \, cm,$

$W_B = 4 \, kg \quad r_B = 4 \, cm.$

FIGURE: 12

FIGURE: 13

18 m

FIGURE:14

Rope

$W_1 = 150 \, N$

$W_2 = 200 \, N$

$(90 - \theta)$

θ

FIGURE:15