B. E. First Semester (All) / SoE – 2018-19 Examination

Course Code : CV 2101 **Course Name : Engineering Mechanics**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.
(6) Use of non programmable calculator is permitted.

1. (A) (A1) The force system shown in figure 1 has a resultant of 200 N pointing up along Y axis. Determine the value of force 'F' and inclination θ with respect to horizontal.

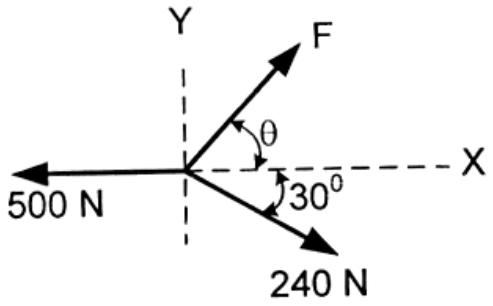

Figure-1

8 (CO 1)

(A2) What is Couple ? State properties of couple. 2 (CO 1)

OR

(B) (B1) Four forces of magnitudes 20 N, 40 N, 60 N and 80 N are acting respectively along the four sides of a square as shown in Figure 2. Determine the resultant and its X intercept with respect to point A.

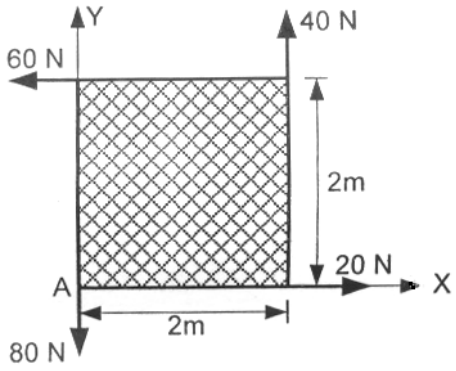

Figure 2

8 (CO 1)

(B2) State and explain principle of transmissibility of forces. 2 (CO 1)

2. (A) (A1) Two identical rollers each of weight 1000 N are supported by an inclined plane of 30^0 with horizontal and a vertical wall as shown in the figure-3. Find the reactions at each contact point. Assume all the contact surfaces as smooth.

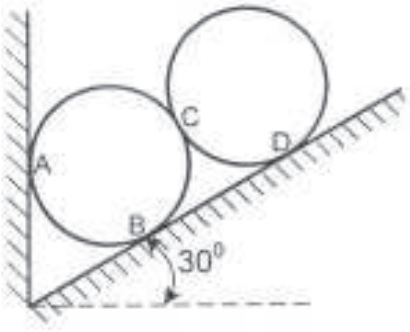

Figure-3

8 (CO 1, 2)

(A2) State and explain different types of beams. 2 (CO1, 2)

OR

(B) (B1) A beam AB of length 8 m supported at its end by hinge support at A and roller support at B. Find the support reactions for the loaded beam shown in Figure 4

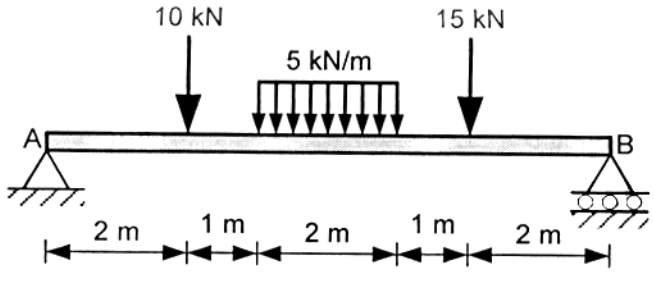

Figure-4

8 (CO 1, 2)

(B2) State conditions of equilibrium for coplanar concurrent force system. 2

3. (A) (A1) Determine the range of value of W for which 500 N block neither will move up nor slide down the plane. The coefficient of static friction between the contact surfaces is 0.2. Assume the pulley to be frictionless. (Refer Figure 5)

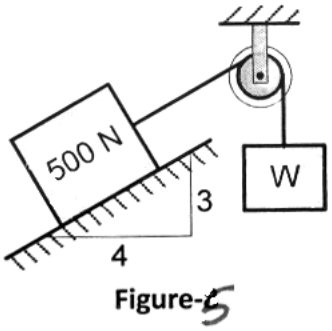

Figure-5

8 (CO 1, 2)

(A2) State the laws of static friction. 2 (CO 2)

OR

(B) (B1) Analyse the truss shown in Figure 6 by method of joint and write the result in tabular form.

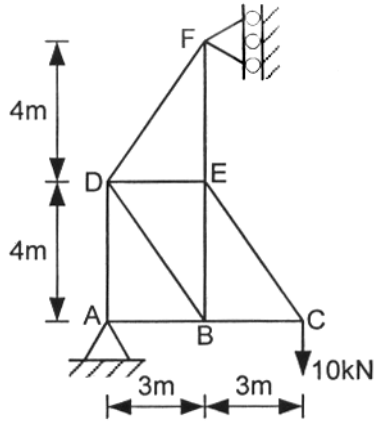

Figure- 6

8 (CO 1, 2)

(B2) State the assumption made in analysis of trusses. 2 (CO 1, 2)

4. (A) (A1) For the shaded area shown in figure 07 calculate centroids with respect to given axis.

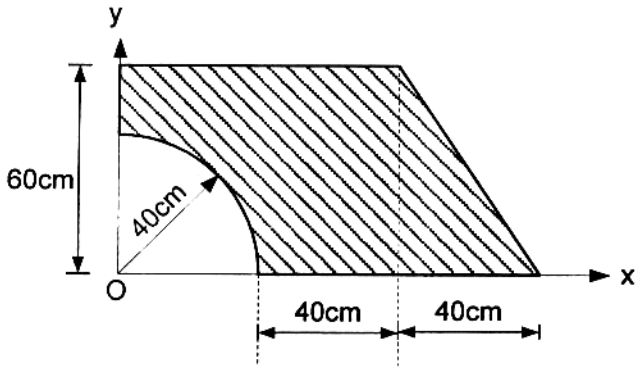

Figure-07

8 (CO 1, 3)

(A2) State the parallel axis theorem. 2 (CO 3)

OR

(B) (B1) Calculate product of inertia of the shaded area shown in figure-8 with respect to given axis.

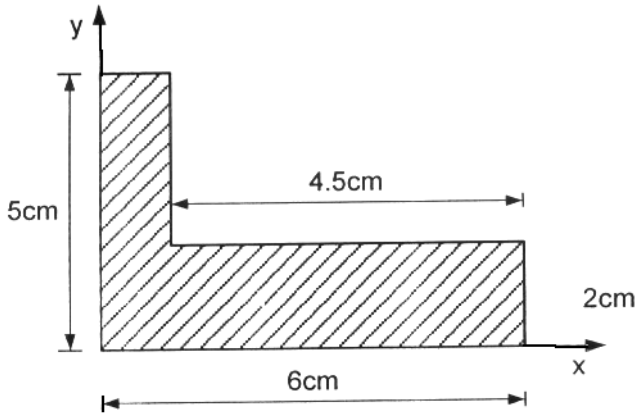

Figure-8

8 (CO 1, 3)

(B2) Define center of gravity and centroid. 2 (CO 1, 3)

5. (A) (A1) Two blocks shown in Figure 9 having weights 150 N and 100 N respectively. Determine the acceleration of blocks, if the coefficient of friction between the block and horizontal surface is 0.2. Assume the pulleys to be frictionless.

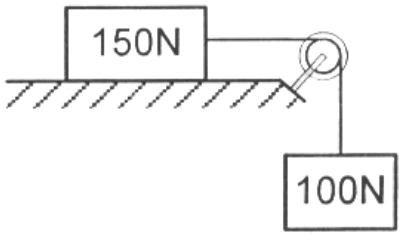

Figure-9

8 (CO 1, 4)

(A2) State and explain D' Alembert's principle. 2 (CO 4)

OR

(B) (B1) Determine the horizontal component of the reaction at E for the frame as shown in Figure 10. Use method of virtual work.

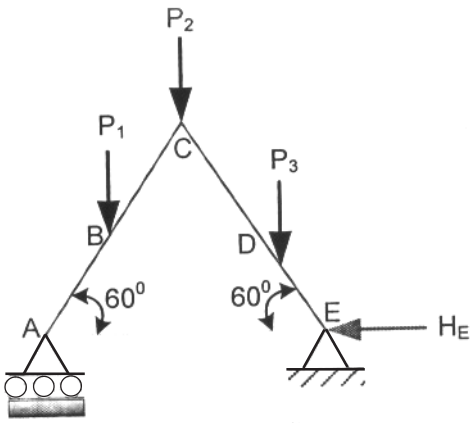

Figure-10

8 (CO 1, 4)

(B2) State the principle of virtual work. 2 (CO 1)

6. (A) (A1) A Bullet 'A' of mass 0.01 kg moving with a velocity of 100 m/s hits a bob 'B' of simple pendulum of mass 1 kg horizontally as shown in figure 11. Find the maximum angle through which pendulum swings after impact when,

(i) Bullet gets embedded in bob,

(ii) Bullet rebound from the surface of bob with a velocity of 20 m/s.

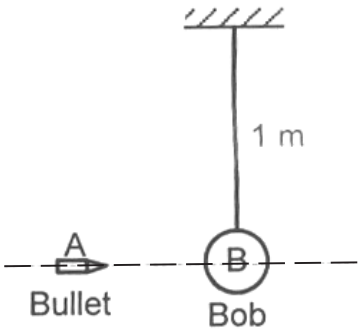

Figure-11

8 (CO 1, 4)

(A2) What are impulsive forces ? Give examples. 2 (CO 1)

OR

(B) (B1) In the system of block shown in Figure 12 if m_1 = 8 kg and m_2 = 5 kg. Determine the velocities of block after the block of mass m_2 is displaced by 2 m.

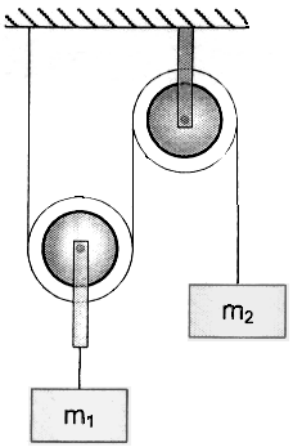

Figure 12

8 (CO 1, 4)

(B2) State Work Energy principle. 2 (CO 4)