Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. / M. Tech. / Ph.D.

End-Semester Examination April-May, 2019

Branch	**: B Tech**	**Semester**	**: 2nd**
Title of the Course	**: Engineering Mechanics**	**Course Code**	**: MEL 102**

Time: 3 Hours **Maximum Marks: 50**

Note : attempt any five questions. All questions carry equal marks. If any data is missing, assume and mention.

Q. 1a Define product of inertia. Mention its salient features. (2)

Q. 1b Consider a semi circular area of diameter 4 cm as shown in figure 1. Determine its moment of inertia about a tangent parallel to the diameter. (8)

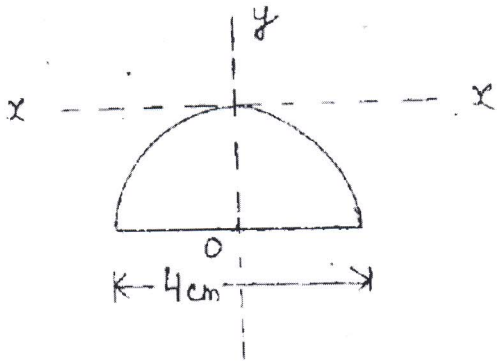

Figure 1

Q. 2 A beam has been loaded and supported as shown in figure 2. Determine the reactions at A and B. (10)

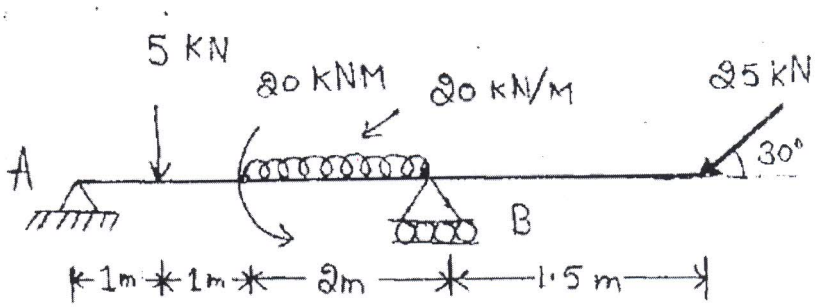

Figure 2

Q. 3a What is reversibility of a machine? Explain. Show for reversible machine, the efficiency should be greater than 50 %. (5)

Q. 3b Show by graph variation of mechanical advantage with load as well as variation of efficiency with load. (5)

Q. 4 Using any method, find forces in members ED, DF and FC for loaded and supported truss as shown in figure 3. (10)

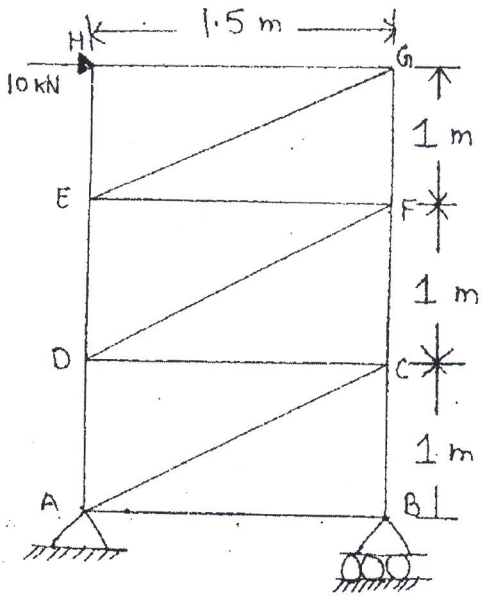

Figure 3

Q. 5 In figure 4, the coefficient of friction is 0.20 between the rope and the fixed drum, and between the other surfaces of contact, $\mu = 0.3$,. Determine the minimum weight W, to prevent downward motion of the 1000 N body. (10)

Q. 6 Determine the tension in the strings and the velocity of 1500 N block shown in figure 4, 5 seconds after starting,
(a) from rest
(b) with a downward velocity of 3 ms/s
Assume pulleys as weightless and frictionless. (10)

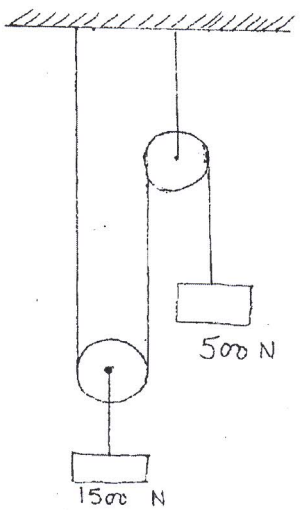

Figure 4

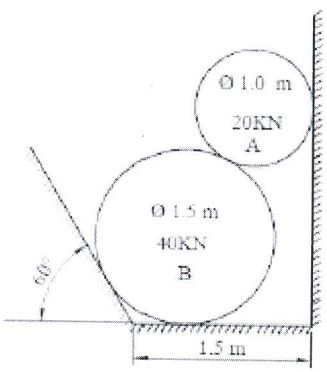

Figure 5

Q. 7 Cylinders A (diameter 1 m, weight 20 kN) and cylinder B (diameter 1.5 m, weight 40 kN) are arranged as shown in figure 5. Find the reactions at all contact points. All contact points are smooth. (10)