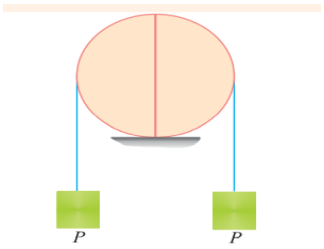
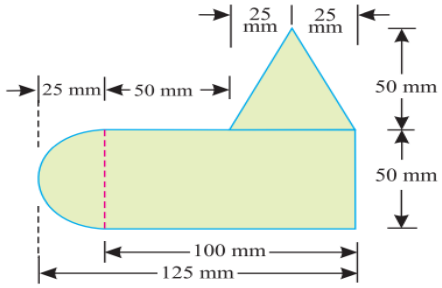
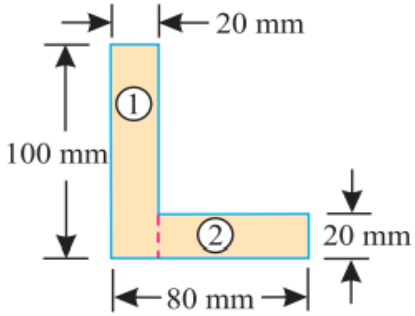
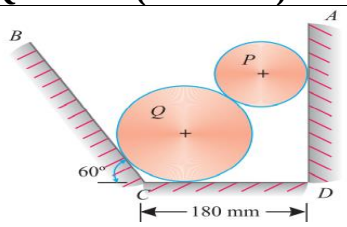
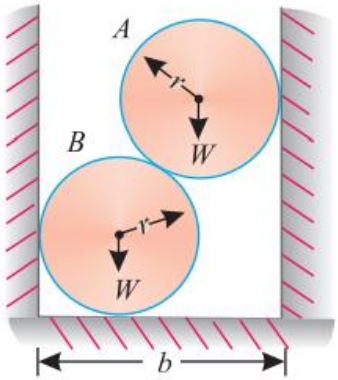
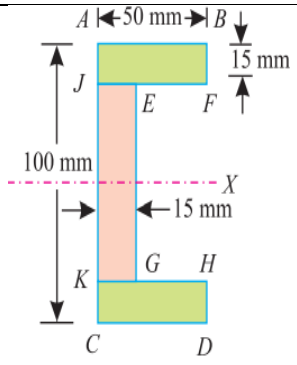
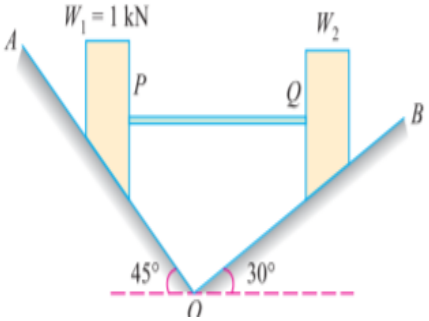
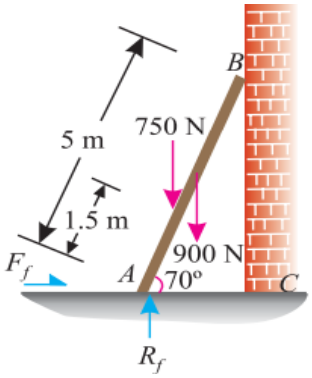
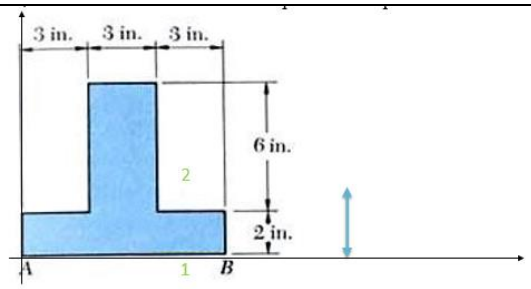
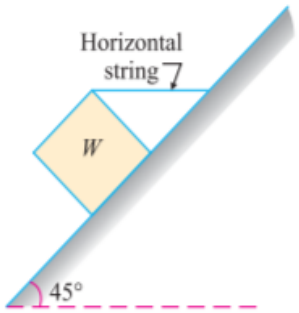
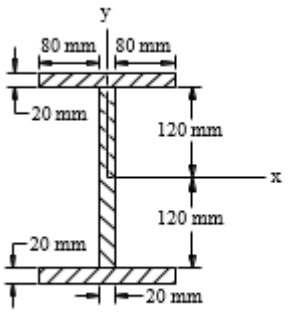
ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END SEMESTER EXAMINATION** (Academic Session: 2020 – 21)		
Name of the Program:	B.Tech in ME/EE/ECE/BioM/Biotech/CSE/CE	**Semester:**	2nd Semester
Paper Title:	Engineering Mechanics	**Paper Code:**	MEE11002
Maximum Marks:	50	**Time Duration:**	3 Hrs
Total No. of Questions:	**17**	**Total No of Pages:**	5
(Any other information for the student may be mentioned here)	**1.** At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. **2.** All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. **3.** Assumptions made if any, should be stated clearly at the beginning of your answer.		

Group A **Answer All the Questions (5 x 1 = 5)**			
1	If a rigid body is in equilibrium under the action of three forces, then a) These forces are equal b) The lines of action of these forces meet in a point c) The lines of action of these forces are parallel d) (b) and (c) above e) None of the above.	**Knowledge Level**	**CO1**
2	The moment of inertia of a square of side *a* about its diagonal is, a) $a^4/8$ b) $a^4/12$ c) $a^4/36$ d) $a^4/16$		**CO2**
3	The force of friction always acts in a direction opposite to that (a) In which the body tends to move (b) In which the body is moving (c) Both (a) and (b) (d) None of the two		**CO3**
4	The principle of virtual work can be applied for all types of (a) possible displacements (b) impossible displacement (c) none of the two		**CO4**
5	The time of flight of a projectile on an upward inclined plane depends upon (a) angle of projection (b) angle of inclination of the plane (c) both ‘a’ and ‘ b’ (d) none of the above		**CO5**

Group B **Answer All the Questions (5 x 2 = 10)**			
6 a)	Two halves of a round homogeneous cylinder are held together by a thread wrapped round the cylinder with two weights each equal to P attached to its ends as shown in fig. The complete cylinder weighs W newton. The plane of contact, of both of its halves, is vertical. Determine the minimum value of P, for which both halves of the cylinder will be in equilibrium on a horizontal plane. 		**CO1**
(OR)			
6 b)	The following forces act at a point : (i) 20 N inclined at 30° towards North of East, (ii) 25 N towards North, (iii) 30 N towards North West, and (iv) 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force		**CO1**
7 a)	A uniform lamina shown in Fig. 6.14 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm 		**CO2**
(OR)			
7 b)	Find the moment of inertia about the centroidal X-X axes of the angle section shown in Fig. 		**CO2**
8 a)	Derive the angle of repose=angle of friction		**CO3**
(OR)			
8 b)	Define the term of Limiting friction, Angle of friction, Angle of repose, Co-efficient of friction.		**CO3**
9 a)	What is beam? Write down the name of different types of beams.		**CO4**
(OR)			
9 b)	What is the concept of virtual work?		**CO4**
10 a)	Define the terms: Trajectory, Velocity of Projection, Angle of Projection, Time of Flight, Range.		**CO5**
(OR)			
10 b)	Derive the equation of time of flight on a horizontal range.		**CO5**

Group C **Answer All the Questions (7 x 5 = 35)**			
11 a)	Two cylinders P and Q rest in a channel as shown in Fig. The cylinder P has diameter of 100 mm and weighs 200 N, whereas the cylinder Q has diameter of 180 mm and weighs 500 N. 		**CO1**
(OR)			
11 b)	Two smooth spheres of weight W and radius r each are in equilibrium in a horizontal channel of A and B vertical sides as shown in Fig. . Find the force exerted by each sphere on the other. Calculate these values, if r = 250 mm, b = 900 mm and W = 100 N. 		**CO1**
12 a)	Find the centre of gravity of a channel section 100 mm × 50 mm × 15 mm. 		**CO2**
(OR)			
12 b)	Derive the Moment of Innertia of Trianguler Section about the base.		**CO2**
13 a)	Two loads, W1 (equal to 1 kN) and W2 resting on two inclined rough planes OA and OB are connected by a horizontal link PQ as shown in Fig. Find the maximum and minimum values of W2 for which the equilibrium can exist. Take angle of friction for both the planes as 20^0 		**CO3**
(OR)			

13 b)	A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750N stands on a rung 1.5 metre from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. 		**CO3**
14 a)	 Find out MoI about the given axes.		**CO4**
	(OR)		
14 b)	A beam AB of span 5 metres is carrying a point load of 2 kN at a distance 2 metres from A. Determine the beam reactions, by using the principle of the virtual work		**CO4**
15 a)	A rectangular prism (W) weighing 150 N, is lying on an inclined plane whose inclination with the horizontal is shown in Fig. The block is tied up by a horizontal string, which has a tension of 50 N. From fundamentals find (i) the frictional force on the block (ii) the normal reaction of the inclined plane, (iii) the coefficient of friction between the surface of contact. 		**CO3**
	(OR)		
15 b)	A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 25° with the horizontal.		**CO3**
16 a)	A body consists of a right circular solid cone of height 40 mm and radius 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of centre of gravity of the body.		**CO2**
	(OR)		

16 b)	Find out the MoI about the centroid axes.  		**CO2**
17 a)	A bullet is fired with a velocity of 100 m/s at an angle of 45° with the horizontal. How high the bullet will rise ?		**CO5**
	(OR)		
17 b)	A ball is projected upwards with a velocity of 15 m/s at an angle of 25° with the horizontal. What is the horizontal range of the ball ?		**CO5**

Note: The Sample prepared by assuming 5 COs in a course, considering one CO for one Module.

i) If the COs are higher in numbers that can be managed by equating sub-divisional questions

ii) If the COs are lower in numbers, the questions can be increased by equating the number of Cos