Shri Shankaracharya Technical Campus
Shri Shankaracharya Group of Institutions
(Managed by Shri Gangajali Education Scociety, Bhilai)
Junwani, Bhilai-490020 (Chhattisgarh), India
Phone: 0788-2291605, 4088888 Fax: 0788-2291606 E-mail: ssgi@ssgi.edu.in

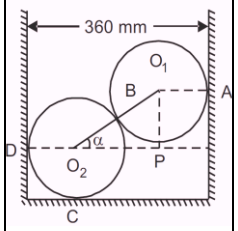
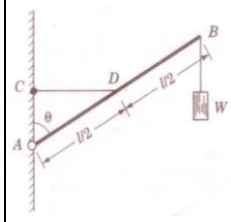
*NIRF ranking 2020 (250-300) band

Class Test-II
Session 2020-21

B.Tech 1st Year | **Semester – I**
Subject Name: Engineering Mechanics | **Subject Code: ME100205**
Duration: 03 Hrs | **Max. Marks: 100**
Min. Marks: 35

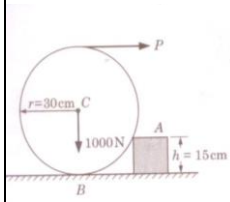
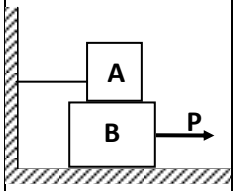
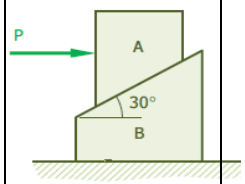
Course Outcomes (CO):
On successful completion of the course, the student will be able to:
CO 1: Calculate and analyze the forces and their effects on the body.
CO 2: Calculate and analyze the effect of frictional forces on the objects in contact.
CO 3: Design and analyze Trusses.
CO 4: Locate the centroid of any shape & will be capable of finding Moment of Inertia about

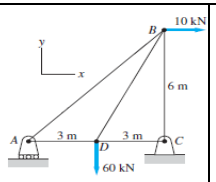
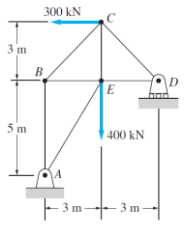
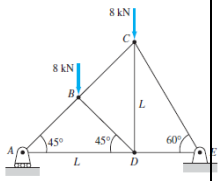
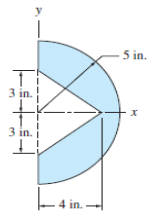
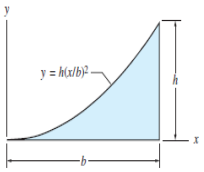
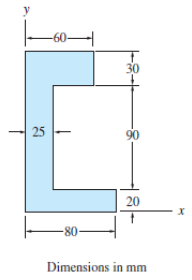
Note: ***All 5 units are compulsory. Part 'a' of each problem is compulsory while any two from part 'b', 'c' and 'd' to be attempted.***

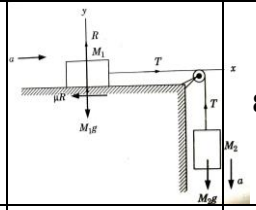
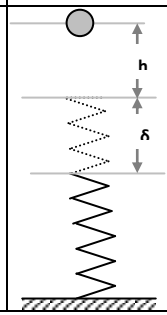
Unit/ Prob. No.	Statement of the Problem	Diagram	Marks	CO	BL	PI
1 a)	State and explain Polygon Law of Forces.	NA	**4**	**CO1**	**L2**	**1.2.1**
1 b)	Two smooth spheres each of radius 100 mm and weight 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D		**8**	**CO1**	**L5**	**1.2.1**
1 c)	A rigid prismatic weightless bar AB of length l is supported in a vertical wall with a hinge as shown in (fig.1.c) If a load W is applied at the free end, find the tension in the string and direction of reaction at the hinge in terms of W and Θ		**8**	**CO1**	**L5**	**1.2.2**

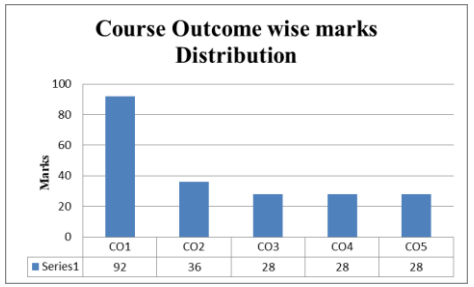
Shri Shankaracharya Technical Campus
Shri Shankaracharya Group of Institutions
(Managed by Shri Gangajali Education Scociety, Bhilai)
Junwani, Bhilai-490020 (Chhattisgarh), India
Phone: 0788-2291605, 4088888 Fax: 0788-2291606 E-mail: ssgi@ssgi.edu.in

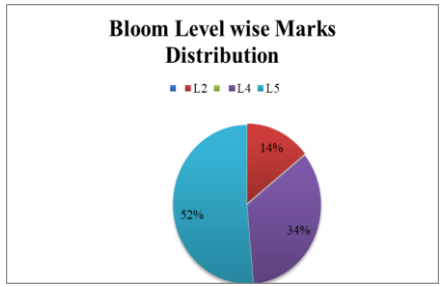
*NIRF ranking 2020 (250-300) band

Unit/ Prob. No.	Statement of the Problem	Diagram	Marks	CO	BL	PI
1 d)	A uniform wheel of 60 cm diameter and 1000 N weight rests against a rectangular block 15 cm high lying on a horizontal plane as shown in (fig.1.d.) Find the force P required to be applied along the circumference so that the wheel is just about to roll over the block.		**8**	**CO1**	**L5**	**1.2.2**
2 a)	State Laws of Static Friction	NA	**4**	**CO2**	**L2**	**1.2.2**
2 b)	Find the minimum force P that could move the block 'B'. Assume coefficient of friction between block A & block B as 0.25 and between Block B and Floor as 1/3. Weight of Block A is 1000 and of Block B is 2000 N.		**8**	**CO1 CO2**	**L4**	**1.2.2**
2 c)	A ladder 6 m long has a mass of 18 kg and its center of gravity is 2.4 m from the bottom. The ladder is placed against a vertical wall so that it makes an angle of 60° with the ground. How far up the ladder can a 72-kg man climb before the ladder is on the verge of slipping? The angle of friction at all contact surfaces is 15°.		**8**	**CO1 CO2**	**L4**	**1.2.2**
2 d)	Determine the minimum weight of block B that will keep it at rest while a force P starts blocks A up the incline surface of B. The weight of A is 100 kN and the angle of friction for all surfaces in contact is 15°.		**8**	**CO1 CO2**	**L4**	**1.2.2**
3 a)	Write basic assumptions of a perfect truss?		**4**	**CO3**	**L2**	**1.2.2**

3 b)	Solve the truss by method of joint. (fig. 3.b)		**8**	**CO1 CO3**	**L4**	**1.2.2**
3 c)	Solve the truss by method of joint. (fig. 3.c) (Horizontal force 300 kN, Vertical force 400kN)		**8**	**CO1 CO3**	**L4**	**1.2.2**
3 d)	Find the Forces in members BC, CD & AD of the truss.(fig 3.d)		**8**	**CO1 CO3**	**L4**	**1.2.2**
4 a)	State Parallel Axes theorem of Moment of Inertia.		**4**	**CO4**	**L2**	**1.2.1**
4 b)	Use the method of composite areas to calculate the centroidal coordinates of the shape shown in fig 4 b		**8**	**CO4**	**L5**	**1.2.2**
4 c)	By integration, calculate the moment of inertia about the *y*-axis of the area shown in Fig 4 c. (Equation of curve: $y = h(x/b)^2$		**8**	**CO4**	**L5**	**1.2.2**
4 d)	Find the moment of inertia about centroidal x-axis. Fig 4 d		**8**	**CO4**	**L5**	**1.2.2**

5 a)	State Impulse - Momentum Principle and conservation of Momentum Principle		**4**	**CO5**	**L2**	**1.2.1**
5 b)	Find the acceleration of the masses and tension of the string. Consider M_1= 10 kg and M_2 = 5 kg, coefficient of friction between all contact surface is 0.25		**8**	**CO2 CO5**	**L5**	**1.2.2**
5 c)	A gun of mass 3000 kg fires horizontally a shell of mass 50 kg with a velocity of 300 m/s. What is the velocity with which the gun will recoil? Also determine the uniform force required to stop the gun if its acceleration is 20.8 m/s^2. In how much time will it stop ?	NA	**8**	**CO5**	**L5**	**1.2.2**
5 d)	A ball of mass *m* is dropped on to a spring of stiffness k from a height *h* find the maximum deflection δ of the spring. Assume m=5 kg, k=500 N/m, h = 10 cm		**8**	**CO5**	**L5**	**1.2.2**





*BL : Blooms Taxonomy Level (1: Remembering, 2 : Understanding, 3: Applying, 4: Analyzing, 5: Evaluating, 6 : Creating)

CO: Course outcome, PO: Program outcomes, PI: Performance Indicator code