



**ACE**  
Engineering College  
(with a Difference in Excellence)  
An AUTONOMOUS Institution



Question Paper Code:

ME301ES

ACE-R20

**Semester End Examination**  
**II B. Tech- I Semester- MARCH-2022**  
**ENGINEERING MECHANICS**  
**(ELECTRICAL AND ELECTRONICS ENGINEERING )**

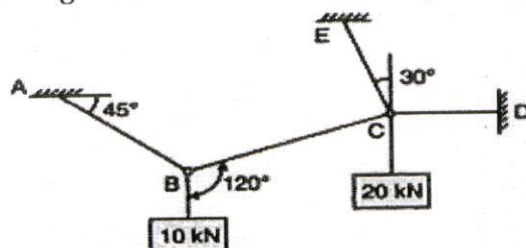
Time: 3 Hours

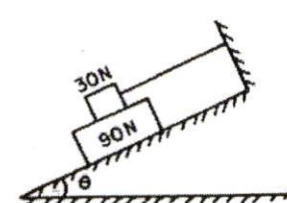
Max. Marks: 70

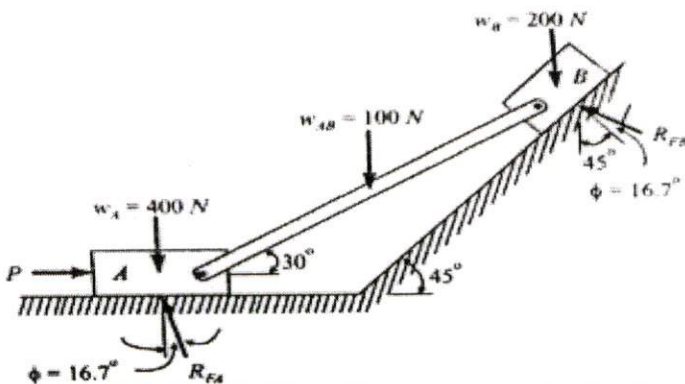
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*Answer any 5 Questions out of 8 Questions from the following*

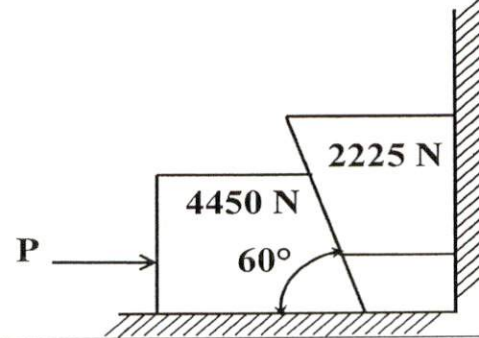
Q.No	Question	M
1. a)	i) What are the necessary and sufficient conditions for equilibrium of general system of forces? ii) Distinguish between moment and couple.	4
b)	Two smooth circular cylinders, each of weight $W = 1000\text{N}$ and radius $15\text{cm}$ , connected at their centers by a string $AB$ of length $40\text{cm}$ and rest upon a horizontal plane supporting above them a third cylinder of weight $2000\text{N}$ and radius $15\text{cm}$ as shown in figure below. Find the force in string $AB$ and the pressure produced on the floor at the points of contact $D$ and $E$ .	10
2. a)	Figure shows two vertical forces and a couple of moment $2000\text{ N-m}$ acting on a horizontal rod which is fixed at end $A$ . Determine the resultant of the system.	7
b)	Two vertical loads are supported by the system flexible and weightless	7

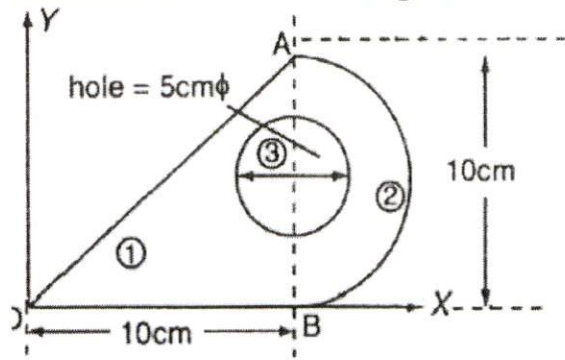
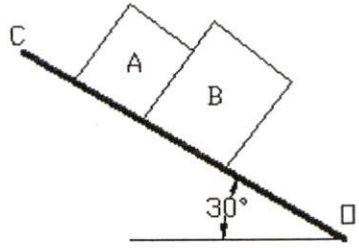
	<p>cables as shown in Fig. Find forces in all cable segments.</p> 	
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<p>3. a)</p>	<p>What should be the value of the angle <math>\theta</math> in Fig. so that the motion of the 90 N block impends down the plane? The coefficient of friction <math>\mu</math> for all the surfaces is <math>1/3</math>.</p> 	<p>4</p>
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<p>b)</p>	<p>The bodies 400 N, 200 N shown in figure are separated by a uniform strut weighing 100 N which is attached to the bodies with frictionless pins. The coefficient of friction under each body is 0.30. Determine the value of horizontal force P that will start the system rightward.</p> 	<p>10</p>
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<p>4. a)</p>	<p>i) What is the relation between coefficient of friction and friction angle?          ii) State the laws of coulomb friction.</p>	<p>4</p>
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<p>b)</p>	<p>Referring to the figure the coefficient of friction are as follows: 0.25 at the floor, 0.30 at the wall, and 0.20 between the blocks. Find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.</p> 	<p>10</p>
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5. a)	Determine the moment of inertia for the area given below about axis AB. 	8
b)	Determine the mass moment of inertia of cone of base radius R, height h, and mass density $\rho$ about its geometric axis.	6
6. a)	An elevator has an upward acceleration of $1 \text{ m/s}^2$ . What pressure will be transmitted to the floor of the elevator by man weighing $600 \text{ N}$ travelling in the elevator? What pressure will be transmitted if the elevator has a downward acceleration of $2 \text{ m/s}^2$ ?	7
b)	A particle moves along straight line. Its motion is represented by the equation: $S = 16t + 4t^2 - 3t^3$ where S is in metres and t, in seconds. Determine i) Displacement, velocity and acceleration 2 seconds after start. ii) Displacement and acceleration when velocity is zero and iii. Displacement and acceleration when acceleration is zero.	7
7. a)	Two blocks A and B slide down the inclined plane OC makes with the horizontal an angle $\theta = 30$ degrees shown in the Fig. If the weight of the blocks $W_A = 20 \text{ N}$ and $W_B = 40 \text{ N}$ and the coefficient of the friction between them and the inclined plane $\mu_A = 0.10$ and $\mu_B = 0.20$ , find the reaction force between the blocks during motion. 	8
b)	The coil spring has a spring modulus $k = 200 \text{ N/mm}$ . How much work must be done to compress it the first $30 \text{ mm}$ from its free length and additional $20 \text{ mm}$ from $30$ to $50 \text{ mm}$ .	6
8. a)	Write about types of motions in kinetics with suitable diagrams.	4
b)	The $3000 \text{ N}$ block starting from rest as shown in the figure 9 slides down on a $50^\circ$ inclined plane. After moving $2 \text{ m}$ it strikes spring whose modulus is $20 \text{ N/mm}$ . If the coefficient of friction between the block and inclined plane is $0.2$ , determine the maximum deformation of the spring and the maximum velocity of the block.	10

