আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
الجامعة الإسلامية العالمية شيتاغونغ
International Islamic University Chittagong
Department of Civil of Engineering (CE), FSE

END-OF-SEMESTER EXAMINATION
SEMESTER SPRING, 2022 SESSION

Programme	: **Civil Engineering**	Level of Study	: **UG 2**
Time	: _____	Date	: _____
Duration	: **One and Half Hours** 3 Hours		
Course Code	: CE2302	Section(s)	: **1**
Course Title	: Analytical Mechanics Sessional		

This Question Paper consists of **Seven (7)** Printed Pages (Including Cover Page) with twenty nine **(29)** Questions.

INSTRUCTION(S) TO CANDIDATES

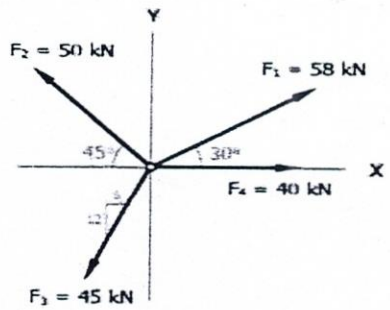
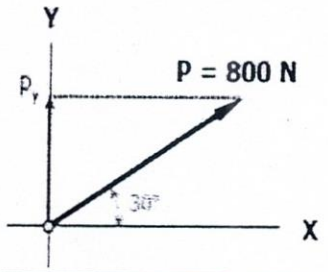
DO NOT OPEN UNTIL YOU ARE ASKED TO DO SO

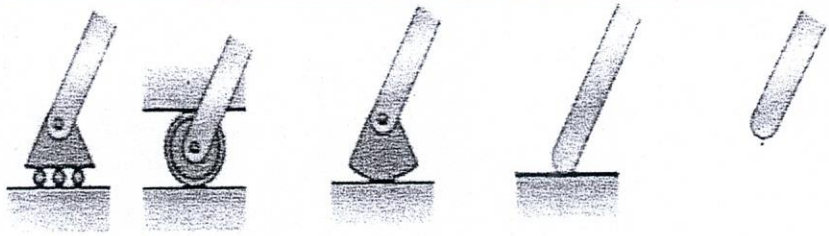
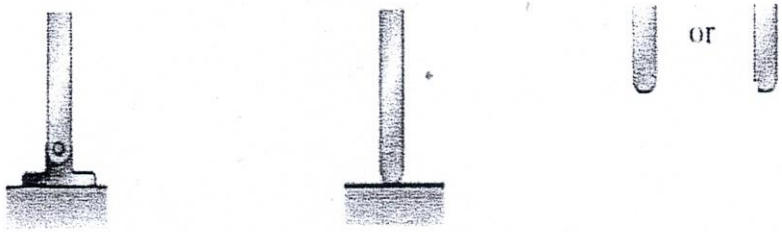
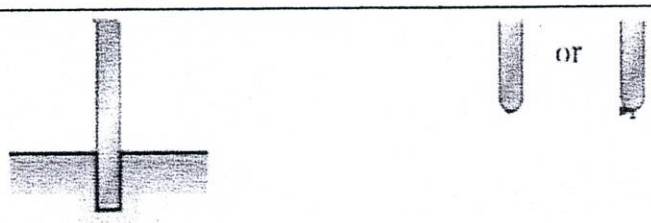
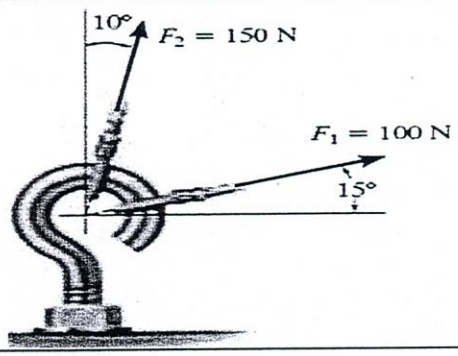
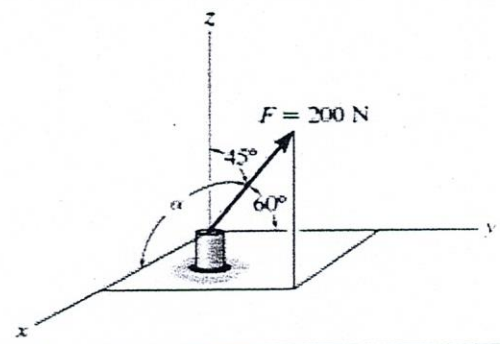
- Total mark of this examination is **100.**
- This examination is worth **50%** of the total course assessment.
- Answer **ALL Questions.**
- Marks assigned to each question are listed in the margin.

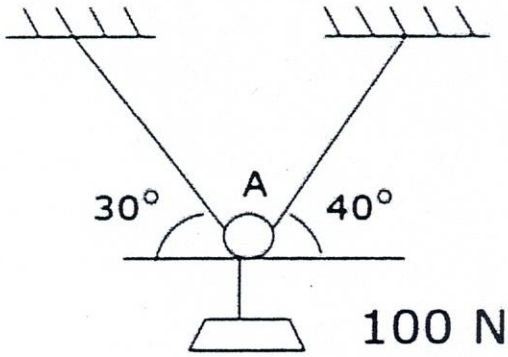
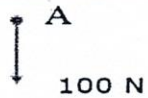
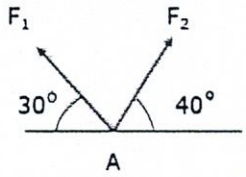
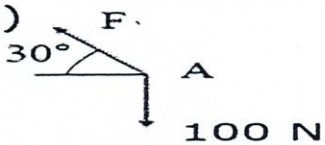
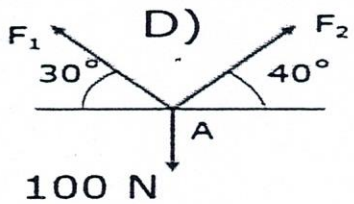
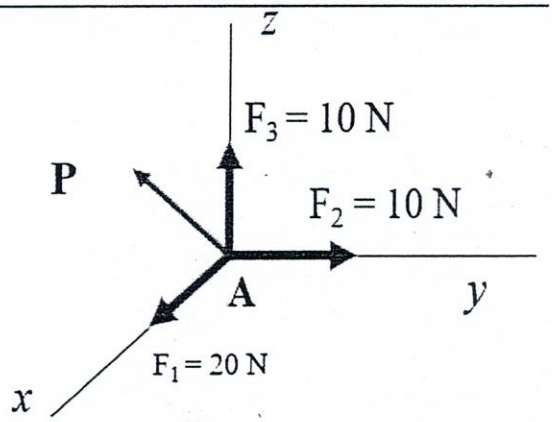
Any form of cheating or attempt to cheat is a serious offence, which may lead to dismissal.

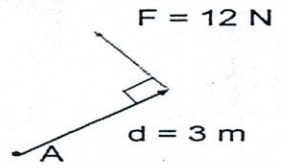
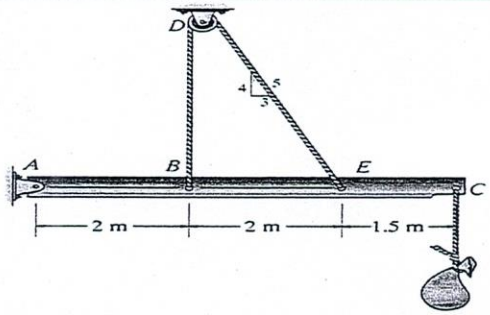
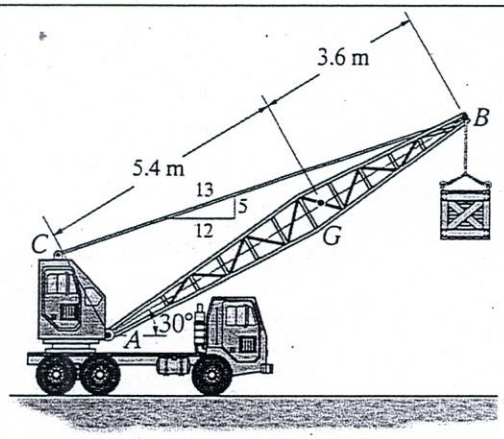
All electronics gadgets are prohibited in the exam hall/venue.

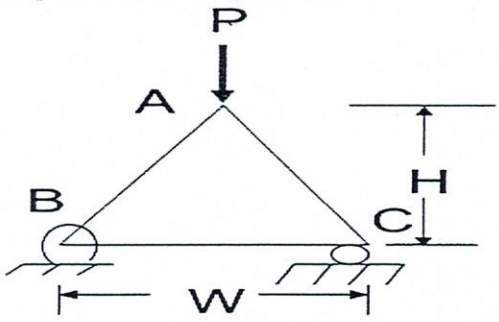
(e.g. mobile/smart phones, smart watches, and smart glasses)

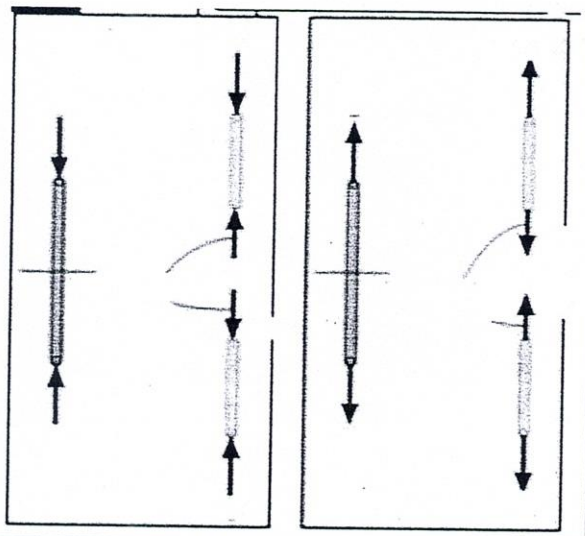
1	Fill-up the blanks		Answer
	Mechanics is the _____ of most engineering sciences and is an obligatory _____to study. Mechanics is an applied science dealing with physical phenomena, which describes and predicts the conditions of rest or _____ of bodies under the action of forces.	a) Grounds, prerequisite, indication b) Foundation, requirement, sign c) Underpinning, condition, motion d) Foundation, prerequisite, motion	
2	Mechanics classified as-	a) Rigid bodies, Deformable bodies and Incompressible & compressible Fluids b) Inflexible bodies, changeable bodies and Fluids c) Rigid bodies, Deformable bodies and Incompressible & compressible Fluids d) Stiff bodies, Deformable bodies and Waters	
3	Define with example the force and Load.		
4	Explain, the force and load are vector quantity		
5	Derive the relationship between force, load, stress, strain and modulus of elasticity.		
6	Determine the component of forces		
7a	Find the y-components of P with respect to x and y- axis		

11	Name and level the following support and showing their reactions Support or connection — Reaction — Unknowns    	
12	The screw eye is subjected to two forces, F1 and F2. Determine the magnitude and direction of the resultant force.	
13	Express the force **F** as Cartesian vector.	

14	Select the correct FBD of particle A  	A)  B)  C)  D)  	
15	In 3-D, when a particle is in equilibrium, which of the following equations apply?	A) $(\Sigma F_x)\,\boldsymbol{i} + (\Sigma F_y)\,\boldsymbol{j} + (\Sigma F_z)\,\boldsymbol{k} = 0$; B) $\Sigma \boldsymbol{F} = 0$ C) $\Sigma F_x = \Sigma F_y = \Sigma F_z = 0$; D) All of the above. E) None of the above.	
16	Four forces act at point A and point A is in equilibrium. Select the correct force vector ***P***.  	A) $\{-20\,\boldsymbol{i} + 10\,\boldsymbol{j} - 10\,\boldsymbol{k}\}$ N B) $\{-10\,\boldsymbol{i} - 20\,\boldsymbol{j} - 10\,\boldsymbol{k}\}$ N C) $\{+20\,\boldsymbol{i} - 10\,\boldsymbol{j} - 10\,\boldsymbol{k}\}$ N D) None of the above.	
17	In 3-D, when you don't know the direction or the magnitude of a force, how many unknowns do you have corresponding to that force?	A) One B) Two C) Three D) Four	

18	What is the moment of the 12 N force about point A (M_A)? 	A) 3 N·m B) 36 N·m C) 12 N·m D) (12/3) N·m E) 7 N·m	
19	The beam and the cable (with a frictionless pulley at D) support an 80-kg load at C. In a FBD of only the beam, there are how many unknowns? A) 2 forces and 1 couple moment B) 3 forces and 1 couple moment C) 3 forces D) 4 forces		
20	Draw a FBD of the crane boom, which is supported by a pin at A and cable BC. The load of 6250 N is suspended at B and the boom weighs 3250 N.		
21	List the equations for Equilibrium for 2D and 3D	2D 3D	

22	Truss ABC is changed by decreasing its height from H to 0.9 H. Width W and load P are kept the same. Which one of the following statements is true for the revised truss as compared to the original truss? 	A) Force in all its members have decreased. B) Force in all its members have increased. C) Force in all its members have remained the same. D) None of the above.	

23	Level and explain the following:- 	
24	A friction force always acts _____ to the contact surface. A) Normal B) At 45° C) Parallel D) At the angle of static friction	
25	If a block is stationary, then the friction force acting on it is _____ . A) $\leq \mu_s N$ B) $= \mu_s N$ C) $\geq \mu_s N$ D) $= \mu_k N$	
26	The _____ is the point defining the geometric center of an object. A) Center of gravity B) Center of mass C) Centroid D) None of the above.	
27	To study problems concerned with the motion of matter under the influence of forces, i.e., dynamics, it is necessary to locate a point called _____. A) Center of gravity B) Center of mass C) Centroid D) None of the above.	
28	The definition of the Moment of Inertia for an area involves an integral of the form A) $\int x\, dA$. B) $\int x^2\, dA$. C) $\int x^2\, dm$. D) $\int m\, dA$.	
29	Select the SI units for the Moment of Inertia for an area. A) m^3 B) m^4 C) $kg \cdot m^2$ D) $kg \cdot m^3$	

END OF PAPER