AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
SPECIALIZED MECH. ENG. PROGRAMS

Spring, 2021/2022	**Course Code: MDP 211x**	**Time allowed: 2 Hrs.**

Machine Elements Design

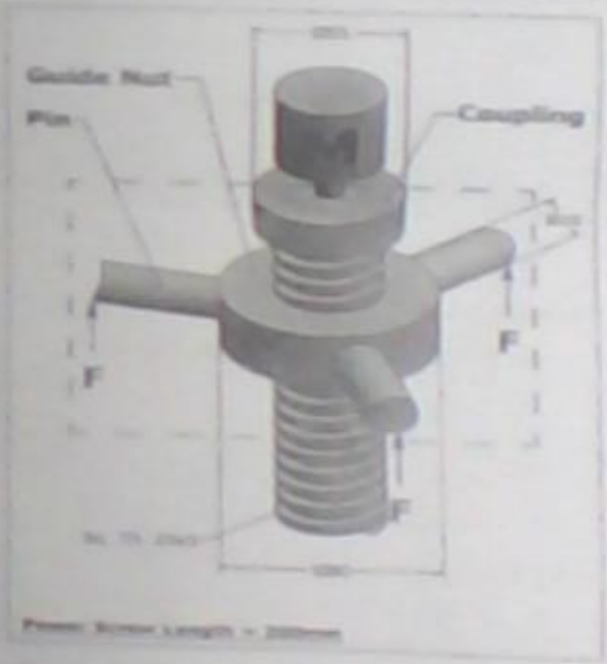
Important Rules:	1 / 4

- Taking a mobile, smart watch, earphones, inside the examination hall is forbidden and is considered as a cheating behavior.
- It is forbidden to take any references, notes, books, or any other materials even if it is not related to the exam content with you in the examination hall.

Note: Reasonable Assumed any missing data or dimensions. Use scaling. For construction and machine drawings, use enough views to show all necessary details. Free hand sketches will be appreciated.

Question [1] [14 Marks]

A group of students at Ain Shams University, Faculty of engineering, is selected to design a pitch control mechanism for [illegible] kW wind Turbine. The **Wind Turbine Pitch Control Mechanism** is used to adjust the turbine blade angle against the wind to achieve the maximum energy conversion efficiency. A DC motor is used to rotate the blade through a **Power Screw Drive** of [illegible] mm size.



The schematic figure represents **Wind Turbine Pitch Control Mechanism** with the main dimensions and loads [illegible] that fulfill the design goals. **You are asked to:**

1) **Draw** a well proportioned computational drawing for the whole part indicating design considerations. Also, use enough views and sections to show all the details.

[10 Marks]

2) **Calculate** the required rotating torque by the motor to rotate the wind blades. Consider Coefficient of friction = 0.3

[1 Marks]

$$T_R = F_x \frac{d_m}{2} \frac{\tan\alpha + \mu'}{1 - \mu' \tan\alpha} = F_y r_{av} \mu_s$$

3) **Draw** the loading diagrams (N x Z) and (T x Z) along the power screw length

[2 Marks]