National University of Computer and Emerging Sciences

Lahore Campus

# Basic Mechanical Engineering (ME2001)

## Sessional-I Exam

**Total Time (Hrs):** 1
**Total Marks:** 40
**Total Questions:** 2

Date: February 24, 2025

**Course Instructor(s)**

1. Mohsin Yousuf (CM)

Roll No _____ Section _____ Student Signature _____

**Do not write below this line**

1. **Attempt all the questions, programmable calculators not allowed.**
2. **Attempt all parts of the same question together.**
3. **Show all the steps with the help of diagrams and answers with proper units.**

***CLO # 01: Calculate the moment of a force/couple using scalar & vector analysis.***

**Q1:** Force $F_A$ has a magnitude of $300N$ and forms an angle of 25° with the plane as shown in Figure 1. Force $F_B$ has a magnitude of $150N$ and forms an angle of 30° perpendicular to the plane. Use the legend as given. **[20 marks]**

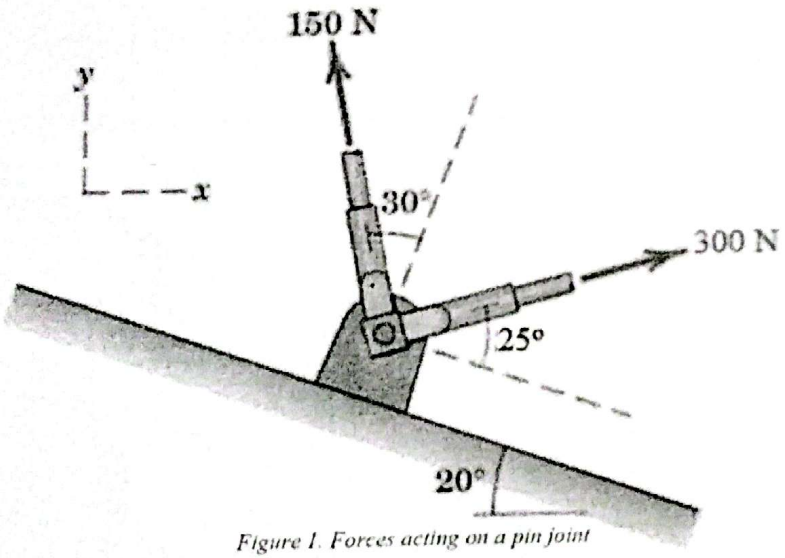


*Figure 1. Forces acting on a pin joint*

(a) **Graphically** add $F_A$ and $F_B$ to **find** the resultant force, $F_R$. **[5]**

(b) **Verify** your answer by adding $F_A$ and $F_B$ using Cartesian vector notation. **[5]**

(c) **Find** the angle between $F_R$ with $F_B$ using dot product. Also, **find** the projection of $F_R$ perpendicular to $F_B$. **[5+5]**

***CLO # 01: Calculate the moment of a force/couple using scalar & vector analysis.***

**Q2:** A force of 800 *N* acts on a bracket as shown in the Figure 2 below. **Calculate** the moment of the force about *B* both using vector formulation and then **verify** it using scalar formulation. **[20 marks]**

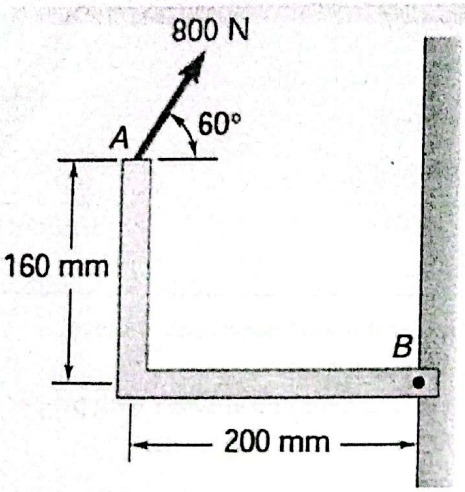


*Figure 2. A Force acting a bracket for moment calculation*