PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY (PNGUOT)
MECHANICAL ENGINEERING

ME311: Mechanics of Machine
First Semester Final Exam, 2023
Third Year Mechanical Engineering
Thursday, June 1st, 2023 – 8:00 A.M
Room No: M118/M1

Time Allowed: 2 Hrs

Instructions:

1. *You have 10 minutes to read the paper. Do not write anything during this time.*
2. *Write your **name** clearly on the front-page using **Capital letters**.*
3. *There are **total five (5) questions**. **Answer any four (4) questions**.*
4. *All questions carry equal marks.*
5. *All questions must be answered only in the booklet provided.*
6. *Calculators are permitted in the examination room.*
7. *Any student found cheating will be disqualified.*

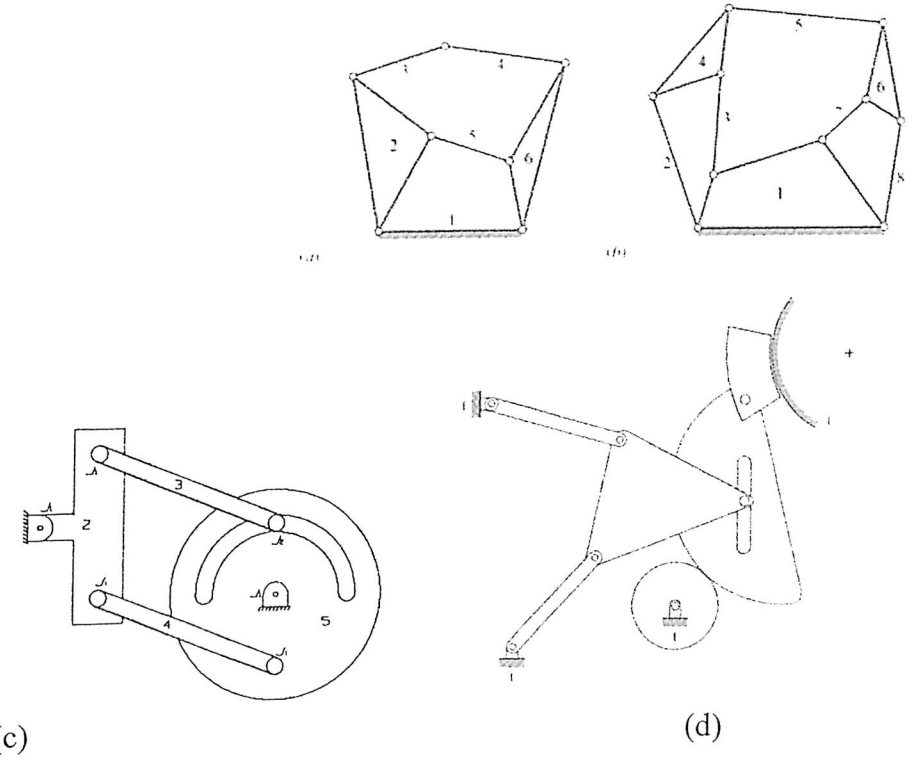
Question 1: (25 Marks)

PART-A **(5 Marks)**

A. What is Kutzbach criterion?

PART-B **(20 Marks)**

B. Use the Kutzbach criterion to determine the mobility of the planar mechanism illustrated in Fig. 1 below. Clearly number each link and label the lower pairs and higher pairs.



(c) (d)

Fig. 1

Question 2: (25 Marks)

PART-A **(5 Marks)**

A. What is Inversion of Mechanism?

PART-B **(20 Marks)**

B. In the mechanism shown below, the slider D is constrained to move on a horizontal path. The crank OA is rotated in a ccw direction at a speed of 150 RPM. The dimensions of the

links are as follows: OA = 180 mm, CB = 240 mm, and BD = 540 mm. For the given configuration find the velocity of slider D and the angular velocity of BD.

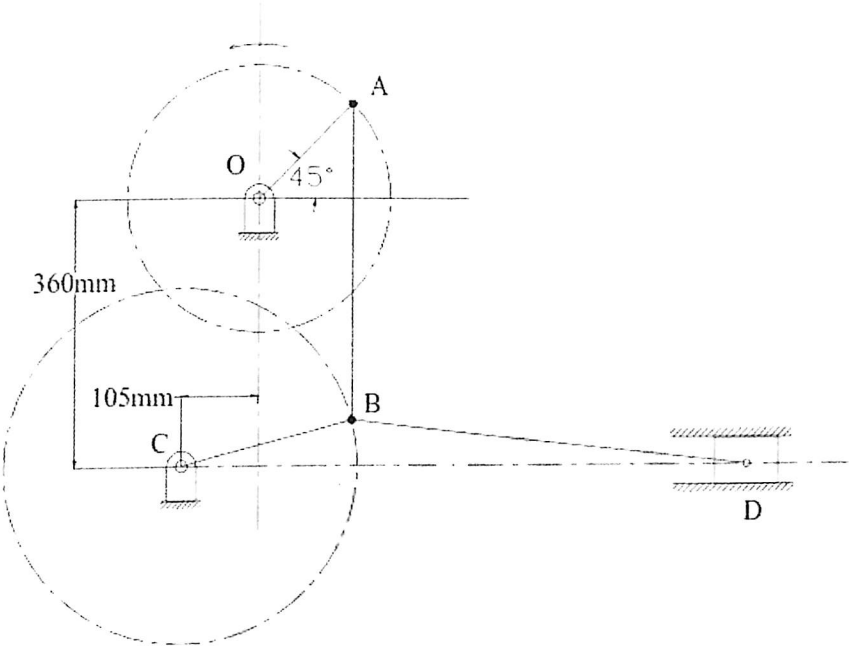


Fig. 2

Question 3: (25 Marks)

A. A shaft runs at 80 rpm and drives another shaft at 150 rpm through belt drive. The diameter of the driving pulley is 600 mm. Determine the diameter of the driven pulley in the following cases:
   (a) Neglecting belt thickness.
   (b) Taking belt thickness as 5 mm
   (c) Assuming for case (b) a total slip of 4%
   (d) Assuming for case (b) a total slip of 2%.

Question 4: (25 Marks)

PART-A **(5 Marks)**

A. What is Addendum and Dedendum?

PART-B **(20 Marks)**

B. Figure 3 gives the pitch diameters of a set of spur gears forming a Gear train. Determine the speed and direction of rotation of gears 5 and 7.

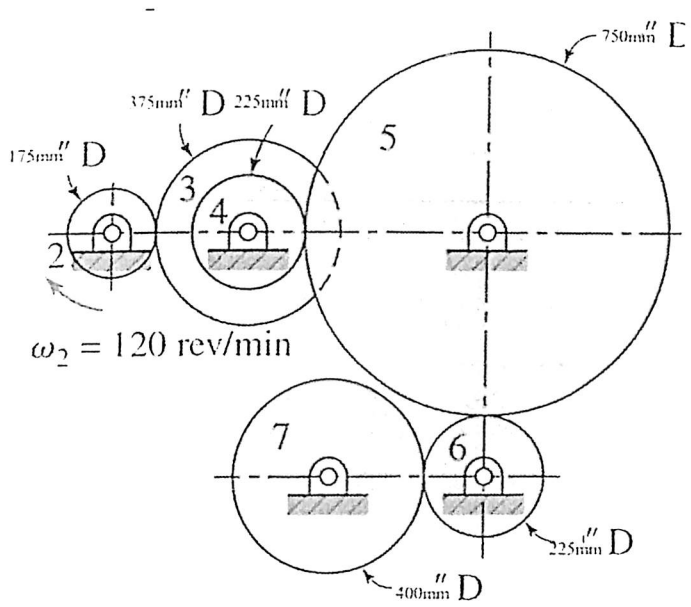


Fig. 3

Question 5: (25 Marks)

PART-A **(5 Marks)**

A. Define a Cam and give some examples?

PART-B **(20 Marks)**

B. A cam is to give the following motion to the knife-edged follower: To raise the follower through 30 mm with uniform acceleration and deceleration during 120° rotation of the cam. Dwell for the next 30° of the cam rotation. To lower the follower with simple harmonic motion during the next 90° rotation of the cam. Dwell for the rest of the cam rotation. The cam has minimum radius of 30 mm and rotates counter-clockwise at a uniform speed of 800 rpm. Draw the profile of the cam if the line of stroke of the follower passes through the axis of the camshaft.

Good luck!!!