

School of Computing Science and Engineering

**Bachelor of Technology in Computer Science and Engineering
Semester End Examination - Jun 2024**

**Duration : 180 Minutes
Max Marks : 100**

Sem VI - E2UC510T - Mechanisms Machines and Automation

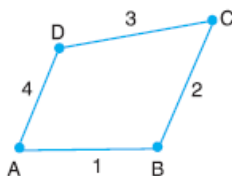
General Instructions

Answer to the specific question asked

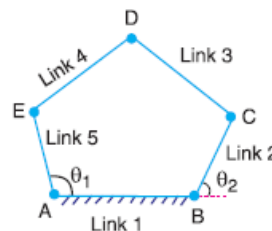
Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) What is the difference between an open-loop and a closed-loop control system? K1(2)
- 2) Present the classification of Kinematic Chains on the basis of contact between the elements with examples. K2(4)
- 3) Define the Degree of Freedom (DoF). Find the DoF in the following Kinematic Chain shown below. K2(6)



and



- 4) Define CNC machining and provide an example of a product that is commonly manufactured using this technique. K3(9)
- 5) Explain the concept of feedback control and how it contributes to system stability. K3(9)
- 6) An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. K5(10)
- 7) Discuss the importance of stability in feedback control systems and provide an example of a system where stability is crucial. K4(12)
- 8) A shaft carries a uniform thin disc of 0.6 m diameter and mass 30 kg. The disc is out of truth and makes an angle of 1° with a plane at K5(15)

right angles to the axis of the shaft. Find the gyroscopic couple acting on the bearing when the shaft rotates at 1200 r.p.m.

- 9) A horizontal cross compound steam engine develops 300 kW at 90 r.p.m. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 0.5\%$ of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 metres. K5(15)

- 10) In an engine mechanism The crank $CB = 100$ mm and the connecting rod $BA = 300$ mm with centre of gravity G, 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s². Find: 1. velocity of G and angular velocity of AB, and 2. acceleration of G and angular acceleration of AB. K6(18)