Code No: R05222106 **R05** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A cam rotating clockwise at a uniform speed of 200 rpm is required to move an offset roller follower with a uniform and equal acceleration and retardation on both the outward and return strokes. The angle of ascent, the angle of dwell between ascent and descent and the angle of descent is 120, 60 and 90 degrees respectively. The follower dwells for the rest of the cam rotation. The least radius of the cam is 50 mm, the lift of the follower is 25 mm and diameter of the roller is 10 mm. The line of the follower is offset by 20 mm from the axis of the cam. Draw the cam profile and find the maximum velocity and acceleration of the follower during outstroke. [16]

2. (a) Distinguish between a Mechanism and a Machine
   (b) State the difference between the closed and open pairs giving examples in each case. [16]

3. The crank and connecting rod of a reciprocating engine are 200 mm and 800 mm respectively. The crank is rotating in clockwise direction at 100 rad/s. Find with the help of Klein's construction :
   (a) Velocity and acceleration of the piston,
   (b) Velocity and acceleration of the mid point of the connecting rod, and
   (c) Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30^0 to I.D.C. (inner dead centre). [16]

4. Figure 5 shows the mechanism of a pneumatic riveter. The arms AB and BC are each 175 mm long, link BE is 500 mm and link DC is 325 mm long. The centre line of the piston is horizontal and 200 mm below A and AC is vertical, BE makes an angle of 12^0 with the vertical. Find the velocity ration between D and the ram E when AC is vertical, and the efficiency of the machine if a load of 2.5 KN on the piston causes a thrust of 5 KN at E. Use instant centre method. [16]

Code No: R05222106 **R05** **Set No. 2**

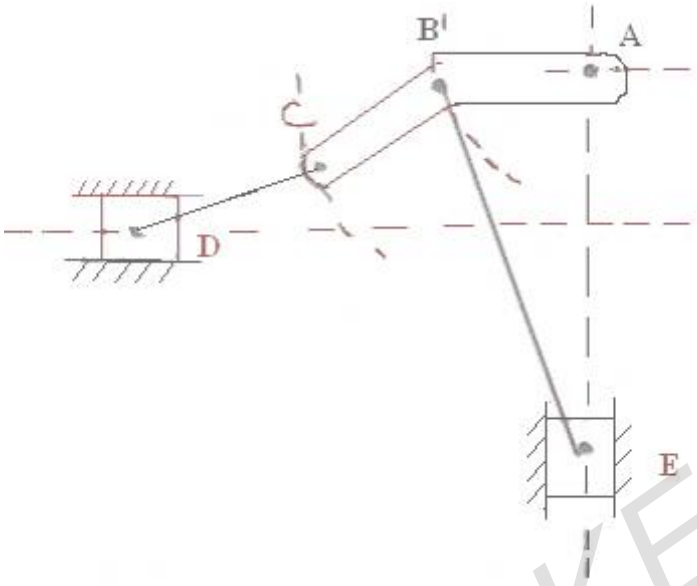

Figure 5

5. (a) Discuss the design procedure for helical gear from first principles.
   (b) Differentiate between bevel gears and warm gears with suitable applications. [8+8]

6. Which mechanism is used as an indicator rig in order to reproduce to a small scale that displacement of the crosshead of a reciprocating engine ? Describe the mechanism. [16]

7. A flat ended valve tappet is operated by a symmetrical cam with circular arc for flank and nose. The straight line path of the tappet passes through the cam axis. Total angle of action $=150^0$, lift = 6 mm, base circle diameter = 30 mm. Period of acceleration is half the period of retardation during the lift. The cam rotates at 1250 rpm, find
   (a) flank and nose radii,
   (b) maximum acceleration and retardation during the lift. [16]

8. (a) Discuss the theories of failure and design procedure when a shaft is subjected both bending and twisting moments simultaneously.
   (b) A solid circular shaft is subjected to a bending moment of 300 N-m and torque of 1000 N-m. The shaft is made of c-45 steel having ultimate tensile stress of 70 N/mm^2 and an ultimate shear stress of 50 N/mm^2. By assuming the factor of safety as 6, determine the diameter of the shaft required. [8+8]

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Code No: R05222106 **R05** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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3. Figure 5 shows the mechanism of a pneumatic riveter. The arms AB and BC are each 175 mm long, link BE is 500 mm and link DC is 325 mm long. The centre line of the piston is horizontal and 200 mm below A and AC is vertical, BE makes an angle of 12^0 with the vertical. Find the velocity ration between D and the ram E when AC is vertical, and the efficiency of the machine if a load of 2.5 KN on the piston causes a thrust of 5 KN at E. Use instant centre method. [16]

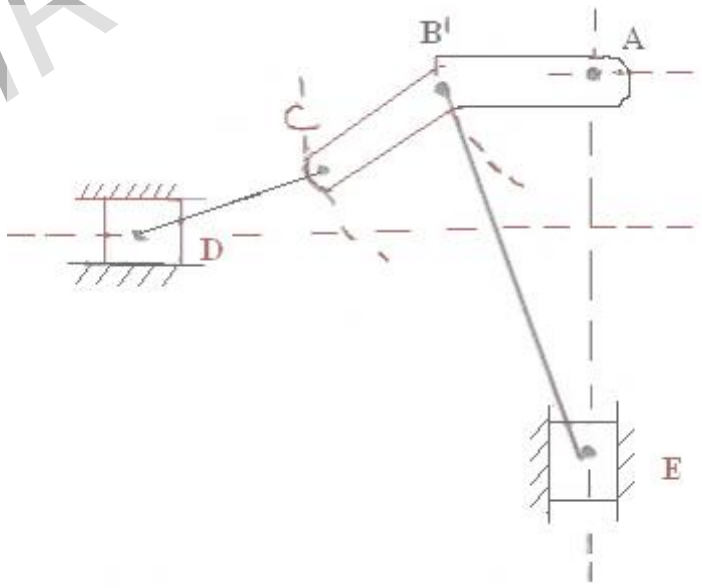

Figure 5

4. (a) Distinguish between a Mechanism and a Machine
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5. A cam rotating clockwise at a uniform speed of 200 rpm is required to move an offset roller follower with a uniform and equal acceleration and retardation on both the outward and return strokes. The angle of ascent, the angle of dwell between ascent and descent and the angle of descent is 120, 60 and 90 degrees respectively. The follower dwells for the rest of the cam rotation. The least radius of the cam is 50 mm, the lift of the follower is 25 mm and diameter of the roller is 10 mm. The line of the follower is offset by 20 mm from the axis of the cam. Draw the cam profile and find the maximum velocity and acceleration of the follower during outstroke. [16]

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8. (a) Discuss the design procedure for helical gear from first principles.

   (b) Differentiate between bevel gears and warm gears with suitable applications. [8+8]

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Code No: R05222106 **R05** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

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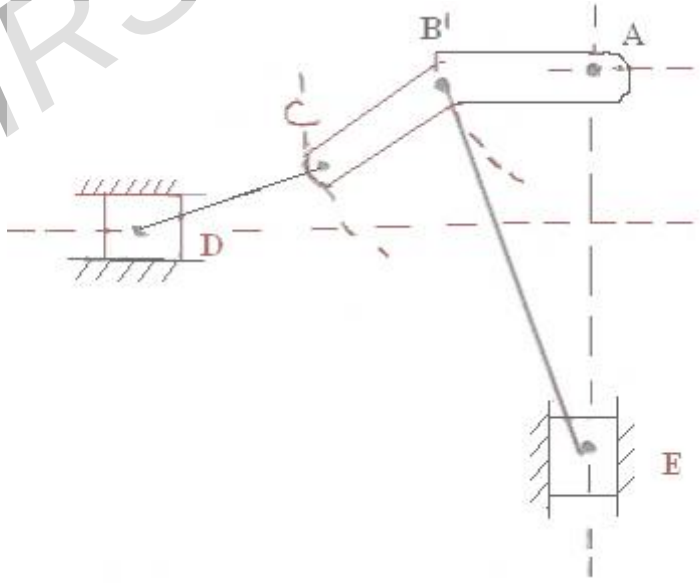

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3. (a) Discuss the design procedure for helical gear from first principles.
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4. (a) Discuss the theories of failure and design procedure when a shaft is subjected both bending and twisting moments simultaneously.

   (b) A solid circular shaft is subjected to a bending moment of 300 N-m and torque of 1000 N-m. The shaft is made of c-45 steel having ultimate tensile stress of 70 N/mm^2 and an ultimate shear stress of 50 N/mm^2. By assuming the factor of safety as 6, determine the diameter of the shaft required. [8+8]

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Code No: R05222106 **R05** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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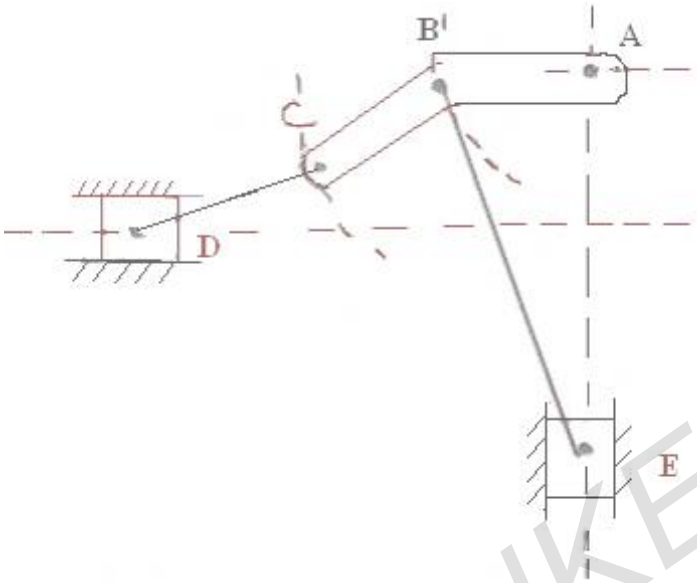

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