SRI RAMAKRISHNA INSTITUTE OF TECHNOLOGY, COIMBATORE-10
(Approved by AICTE, New Delhi – Affiliated to Anna University, Chennai)
Department of Mechanical Engineering

Class	: III Year	Semester	: VI
Topic	: Static Force Analysis	Max Marks	: 50
Duration	: 50 Minutes	Date	: 25-07-13

Part A (Answer all Questions)

1. State and explain D'Alembert's Principle
2. For a reciprocating engine derive the expressions for
   a. Velocity and Acceleration of the Piston
   b. Angular velocity and Angular acceleration of the connecting rod
3. Differentiate static and dynamic force analysis
4. Define the following terms:
   a. Piston Effort
   b. Crank Effort

Part B (Answer all Questions)

1. In a slider crank mechanicsm the length of the crank and connecting rod are 150mm and 600mm respectively. The crank makes ana angle of 60^0 with the IDC and revolves at a uniform speed of 300 r.p.m. Find
   a. Velocity and Acceleration of the slider
   b. Angular velocity and Angular acceleration of the connecting rod

2. A horizontal steam engine running at 240 r.p.m has a bore of 200mm and stroke of 360mm. The piston rod is 20mm in diameter and connecting rod length is 900mm. the mass of the reciprocating parts is 7Kg and the frictional resistance is equivalent to a force of 500N. Determine the following when the crank is at 120^0 from the IDC, the mean pressure being $5000N/m^2$ on the cover side and $100N/m^2$ on the crank side.
   Thrust on the connecting rod, Thrust on the cylinder walls
   Loads on the bearings Turning moment on the crankshaft

3. A Petrol engine has a stroke of 120mm and connecting rod is 3times of crank length.the crank rotates at 1500 r.p.m clockwise,determine:
   a. Velocity and Acceleration of the slider
   b. Angular velocity and Angular acceleration of the connecting rod
   When the piston has travelled $1/4^{th}$ of its stroke from IDC

4. The crank and connecting rod of a vertical petrol engine, running at 1800 r.p.m are 60mm and 270mm respectively. The diameter of the piston is 100mm and the mass of the reciprocating parts is 1.2 kg. During the expansion stroke when the crank has turned 20^0 from the TDC, the gas pressure is $650kN/m^2$. Determine the
   Net force on the piston Net load on the gudgeon pin
   Thrust on the cylinder walls Speed at which the gudgeon pin load is reversed in direction