1	Design a plain carbon steel centre crankshaft for a single acting four stroke, single cylinder engine for the following data: Piston diameter = 250 mm; Stroke = 400 mm; Maximum combustion pressure = 2.5 MPa; Weight of the flywheel = 5 kg; Total belt pull = 100 N; Length of connecting rod = 950 mm. The flywheel is used as a pulley. When the crank has turned through 30^0 from top dead centre, the pressure on the piston is 1 MPa and the torque on crank is maximum. Any other data required for the design may be assumed.
2	Design an overhung Crank shaft with two main bearings for an I. C. engine with the following data: Cylinder bore = 250 mm Stroke length = 300 mm Flywheel weight = 27 kN Maximum pressure = 2.5 N/mm^2 Maximum torque at crank rotation = 1.7 N/mm^2 30^o the pressure at that instant.
3	Design the various components of a valve gear mechanism for a horizontal gas engine with the following data: Diameter of port is 70 mm, its weight is 5 N, and its lift is 25 mm. The maximum combustion pressure is 4.5 MPa. The valve opens 33^o before O.D.C. and closes 1^o after I.D.C. and it is to open with constant acceleration and deceleration for each half of the lift. The gas pressure in cylinder when the exhaust valve start to opens is 0.34 N/mm^2 ,The pressure on the top side of the valve may be taken as 0.1 N/mm^2 absolute and the greatest suction pressure is 0.035 N/mm^2 below atmospheric. The engine runs at 350 rpm. The effective length of each arm of the rocker lever is 175 mm and the included angle is 140^o.
4	Design the various components of a valve gear mechanism for a horizontaldiesel engine having the following specifications: Brake power = 10 kW; Bore = 140 mm; Stroke = 270 mm; Speed = 500 rpm and maximum gas pressure = 3.5 N/mm^2. The valve opens 30° before top dead centre and closes 2° after bottom dead centre. It opens and closes with constant acceleration and deceleration for each half of the lift. The length of the rocker arm on either side of the fulcrum is 150 mm and the included angle is 135°. The mass of the valve is 0.3 kg.
5	Design a rocker arm of I-section made of cast steel for operating an exhaust valve of a gas engine. The effective length of the rocker arm is 250 mm and the angle between the arms is 135°. The exhaust valve is 80 mm in diameter and the gas pressure when the valve begins to open is 0.4 N/mm^2. The greatest suction pressure is 0.03 N/mm^2 below atmospheric. The initial load may be assumed as 0.05 N/mm^2 of valve area and the valve inertia and friction losses as 120 N. The ultimate strength of cast steel is 750 MPa. The allowable bearing pressure is 8 N/mm2 and the permissible stress in the material is 72MPa.
6	Design a side crankshaft for a 500 mm × 600 mm gas engine. The weight of the flywheel is 80 KN and the explosion pressure is 2.5 N/mm^2. The gas pressure at maximum torque is 0.9 N/mm^2 when the crank angle is 30^o. The connecting rod is 4.5 times the crank radius. Any other data required for the design may be assumed.