Assignment Two
Coupling and Clutch Design

1) Two shafts made of plain carbon steel are connected by a rigid protective type flange coupling. The shafts are running at 500 r.p.m. and transmit 25 kW power. Design the coupling completely for overload capacity 25 percent in excess of mean transmitted torque capacity.
   Assume the following permissible stresses for the coupling components:
   Shaft — Permissible tensile stress = 60 MPa; Permissible shear stress = 35 MPa
   Keys — Rectangular formed end sunk key having permissible compressive strength = 60 MPa
   Bolts — Six numbers made of steel having permissible shear stress = 28 MPa
   Flanges — Cast iron having permissible shear stress = 12 MPa
   Draw the coupling you have designed.
2) A multiple-disk wet clutch is required to provide a torque capacity of 204 N-m. Design values of p = 1034 kPa and μ = 0.15 are to be used. Disk inside and outside diameters are to be 76 and 102 mm, respectively.

   (a) What total number of disks should be used? Make a simple sketch showing how these are arranged with respect to the input and output shafts.

   (b) Using your answer from part (a), what is the smallest value of axial clamping force that would provide the necessary torque capacity?

   (c) Assuming that your solution was (appropriately) based on a uniform rate of wear across the friction surfaces, explain briefly what will happen when the clutch is new and the pressure distribution is uniform.

3) A leather faced cone clutch transmits power at 500 rpm. The semi-cone angle is 12.5°. The mean diameter of the clutch is 300 mm, while the face width of the contacting surface of the friction lining is 100 mm. The coefficient of friction is 0.2 and the maximum intensity of pressure is limited to 0.07 N/mm^2. Calculate the force to engage the clutch and the power transmitting capacity.