Wasit University/ College of Engineering
Mechanical Engineering Department

Class: 4th — **Exam: Final- 3rd attempt**
Subject: Design of machine systems — **Date: 6 / 11 / 2018**
Time: 3 Hours — **Examiner: Dr. B. M. Faisal**

Note: - Using the sheets of rules and tables is allowed.

Q1) A start square (normal series) power screw of 40 mm nominal diameter is acted upon by an axial load of 50 kN. The outside and inside diameters of the screw collar are 40 mm and 20 mm respectively. The coefficient of friction for both thread and collar are 0.2. The screw rotates at 20 r.p.m. The allowable thread bearing pressure is 15 N/mm2 and the shear yield strength is 70 N/mm2. By using the uniform wear theory, determine a) the dimensions of the screw and the height of the nut, b) the number of the threads of the nut which are in engagement with screw, c) the stresses in the screw and the nut, d) the power required to drive the screw and state if the design is safe or not. **(12 Marks)**

Q2) A rope drum with three grooves is used for slings a load of 39 kN in an elevator for 100 m with an acceleration of 0.9 m/s^2. Design this grooved drum and the wire rope by using standard hosting wire rope from grade 120. Use Er = 70 kN/mm^2. **(12 Marks)**

Q3) Design a simplex roller chain to transmit power from 20 kW and 1100 r.p.m motor to a reciprocating pump. The pump operates continuously 24 hr/day at speed of 300 r.p.m. The center distance is 40 times the pitch and it's correct for 5mm. **(12 Marks)**

Q4) Determine the principal dimensions of a cone clutch faced with lather to transmit 40 kW at 800 r.p.m. from an electric motor to an air compressor. Sketch a sectional front view of the clutch and provide the main dimensions. Assume that the semi-angle of the cone is 10°, the coefficient of friction is 0.3, mean diameter of cone is (7-10)d, where d is the diameter of the shaft, allowable normal pressure for lather and cast iron is 0.1 to 0.2 N/mm2, shear stress 100 N/mm2, load factor is 2 and the mean diameter to face width ratio is 6. **(12 Marks)**

Q5) Design a journal bearing for a main slow speed steam engine from the following data: load on the journal is 50000 N, speed of the journal 1000 r.p.m., type of oil SAE30 at working temperature of 60 °C, specific heat of the oil is 1900 J/Kg/°C, the ambient temperature of the oil is 20 °C, and the maximum pressure for the engine is 15N/mm^2. Also state if the bearing working under hydrodynamic conditions or not and calculate the mass of the lubricating oil required for artificial cooling if the heat dissipation coefficient is 2000 $W/m^2/°C$ and the rise of the temperature of oil be limited to 20 °C. Assume the length of theb journal is 80 mm. **(12 Marks)**

14369-6

Lecturer
Dr. B. M. Faisal

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Wasit University
Engineering College
Mech. Dept.

Sub:fluid mech.
Time:3 hour
Date: / 9/2018
Class: 2nd year

Answer 5 questions only

Q1) The distribution of velocity of a fluid over a fixed plate is given by an equation $u = 0.5y - y^2$ where u is the velocity of flow at a distance y from the fixed plate. Determine the shear stress at y =0, y = 0.1m and y = 0.2m if the dynamic viscosity is 0.75 $N.s/m^2$.

Q2) Calculate the specific weight, specific volume and specific gravity of a liquid having a volume of 6 m^3 and weight of 40 kN.

Q3) The cylindrical vessel shown in fig.1 is rotated about vertical axis contain water to a depth of 1.5 m. Calculate:

1. The angular velocity at which water will start to spill over the sides.
2. The angular velocity at which the water depth at the centre is zero and the volume of water lost for this case.

Q4) Compute the horizontal and vertical components of the hydrostatic force on the quarter circle panel at the bottom of the water tank shown in fig.2

Q5) A solid cylinder shown in fig.3 of diameter 4 m has a height of 4 m find the metacentric height of the cylinder if the specific gravity of the cylinder is 0.7 and is floating in water with its axis vertical. State whether the equilibrium is stable or unstable.

Q6) Three pipes steadily deliver water to a large exit pipe as shown in fig.4. If the velocity V_2 = 5m/s and the exit flow rate Q_4= 120m^3/h. Find V_1, V_3, V_4 if it is known that increasing Q_3 by 20%would increase Q_4 by 10%.

Examiner
Asst. prof. Dr. Hadi Abeid

GOOD LUCK

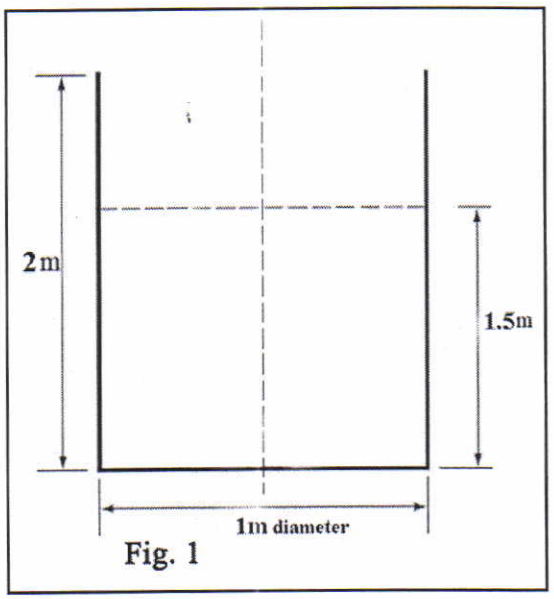


Fig. 1

Fig. 2

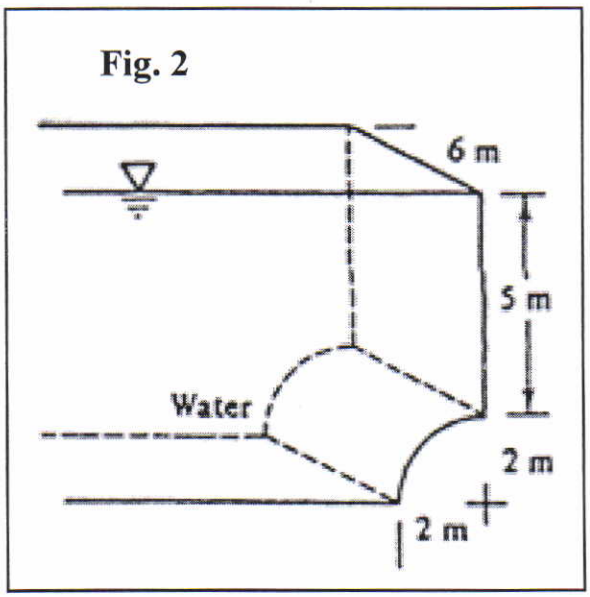
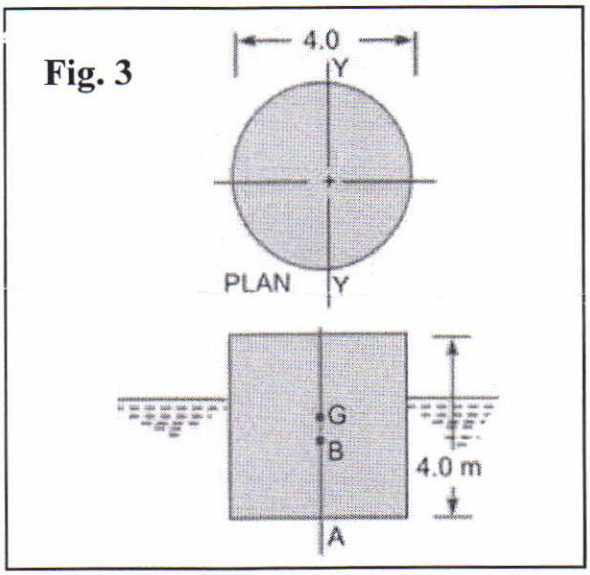


Fig. 3



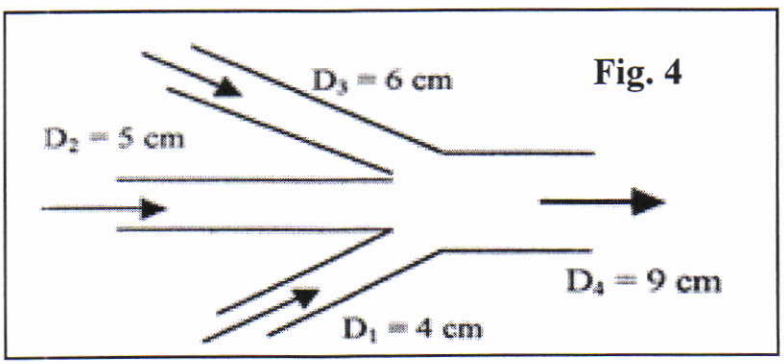


Fig. 4