## College of Engineering \& Technology

Department: Mechanical Engineering Marks: 20
Lecturer: Dr. Rola Afify
Time: 4:00-5:00
Course Code: ME362
Date: $6 / 5 / 2015$
Name:
R. N.:

## Answer the following questions:

## Question one ( 10 marks)

A) A 5 m high and 5 m wide rectangular plate blocks the end of a 4 m deep freshwater channel as shown in Figure. The plate is hinged about a horizontal axis along its upper edge through a point A and is restrained from opening by a fixed ridge at point B . Determine the force exerted on the plate by the ridge.
B) If the resultant pressure force on the circular gate shown in Figure is inclined $50^{\circ}$ to the horizontal. Calculate the height of water in the tank ' h ' and the magnitude of the resultant pressure force on the gate. Given that gate width $=0.5 \mathrm{~m}$.


## Question two ( 10 marks)

A) Compare between Rotational and Irrotational flows.
B) Water is flowing in the conduit shown in figure. If the flow rate Q is $8 \mathrm{lit} / \mathrm{s}$ and the diameters $\mathrm{d}_{1}, \mathrm{~d}_{2}$ and $\mathrm{d}_{3}$ at sections 1,2 and 3 are 50,60 and 100 mm respectively, find the flow velocities $v_{1}, v_{2}$ and $v_{3}$. If the pressure $\mathrm{P}_{1}$ at section 1 is 24.5 kPa , what is
 the pressure $P_{3}$ at sections 3?
C) What diameter orifice hole, $d$, is needed if under ideal conditions the flowrate through the orifice meter is to be $0.4 \mathrm{~m}^{3} / \mathrm{sec}$ of water with $\mathrm{P}_{1}-\mathrm{P}_{2}=$ 2.37 kPa . The contraction coefficient
 is assumed to be 0.63 .

