

SUBJECT CODE NO:- P-62
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination May/June 2017
Fluid Mechanics & Machinery
(Revised)-I

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Solve any three questions from section A and any three questions from section B.
- ii) Assume suitable data if necessary.

Section A

- Q.1 a) What do you mean by the term viscosity? Explain. 05
b) A solid cone of maximum radius R and vertex angle 2θ is rotating with an angular velocity of ω . An oil of viscosity μ and thickness t fills the gap between the cone and the housing. Derive an expression for the torque required and the rate of heat dissipation in the bearing. 08
- Q.2 a) Explain different types of equilibrium of floating bodies. 05
b) A hollow wooden cylinder of specific gravity 0.7 has an outer diameter of 610 mm and inner diameter of 310 mm it is required to float in oil of specific gravity 0.9. calculate: 08
i) The maximum length (height) of cylinder so that it shall be stable when floating with its vertical axis
ii) The depth to which it will sink.
- Q.3 a) Derive Bernoulli's equation for flow of an incompressible frictionless fluid from consideration of momentum. 06
b) An oil of sp. gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm The oil- mercury differential manometer shows a reading of 20 cm. calculate the discharge of oil through the horizontal venturimeter. 07
Take $C_d = 0.98$.
- Q.4 a) Explain the following terms: 08
i) Model
ii) Prototype
iii) Model analysis
iv) Hydraulic analysis
b) An air duct is to be modeled to a scale of 1:20 and tested with water which is 50 times viscous and 800 times denser than air. When tested under dynamically similar conditions, the pressure drop between two sections in two model is 235 KPa. What is the corresponding pressure drop in prototype? 05
- Q.5 Answer any 2 of following: 14
a) What is vapour pressure? Explain.
b) Explain piezometer.
c) Explain application of CFD.

SECTION B

- Q.6 a) Show that the force exerted by a jet of water on moving inclined plate in the direction of jet is given by $F_x = \rho \cdot a \cdot (V - u)^2 \sin^2 \theta$ 07
Where ,
a - area of jet.
v - velocity of jet.
Q - Inclination of plate with jet.
- b) A jet of water of diameter 60 mm moving with a velocity of 40 m/s, strikes a curved fixed symmetrical plate at the center. Find force exerted by the jet of water in the direction of the jet, if the jet is deflected through an angle of 120° at the outlet of the curved plate. 06
- Q.7 A single jet pelton turbine is required to drive a generator to develop 10000 kw. The available head at the nozzle is 800 mm. Assuming electric generation efficiency 94% pelton wheel efficiency 88%, coefficient of velocity for nozzle 0.97, mean bucket velocity of 0.46 of jet velocity, outlet angle of bucket 15° and relative velocity of water leaving the buckets 0.85 of that jet, find:
i) Flow in m^3/s
ii) Diameter of jet.
iii) The force exerted by the jet on buckets: 13
- Q.8 a) Explain the working of single – stage centrifugal pump with neat sketch. 05
b) A centrifugal pump is delivering 0.04 m^3 of water per second to a height of 20 m through a 150 mm diameter 100 mm long pipeline. If losses in suction pipe are equal to 0.33 m and friction factor is 0.06 for pipeline. find power required to drive the pump. Assume overall efficiency of pump as 70 percent. 08
- Q.9 a) Describe with neat sketch, working of hydraulic coupling. 05
b) It is required to transmit 36.76 kw power from an accumulator through a pipeline 100 mm diameter and 1500 m long. The ram is loaded with a weight of 1226.25 kN and the friction loss in pipeline equals 2 percent of total power being transmitted. Determine the diameter of the ram if friction coefficient is 0.01. 08
- Q.10 a) Obtain an expression for the capacity of a hydraulic accumulator. 07
b) Give the operational difficulties commonly experienced in centrifugal pumps and their remedies. 07