

Roll No.

OLE-3211
B. Tech. 5th Semester (ME)
Examination – April, 2021

FLUID MACHINES

Paper : PCC-ME-309-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question No. 1 is *compulsory*. Attempt *five* questions in all, by selecting *one* question from each section.

1. Explain the following : $2.5 \times 6 = 15$
- (a) Differentiate between radial and axial flow turbines.
 - (b) Net positive suction head
 - (c) Difference between volute casing and spinal casing.
 - (d) Hydraulic Intensifier
 - (e) Design of buckets of Pelton wheel
 - (f) Specific speed

SECTION – A

2. In a particular hydro electric power plant, water available under a head of 300 m is delivered to the power house through three pipes each 40 m long. Through these pipes friction loss is estimated to be 30 m. The project is required to produce a total shaft output of 15.25 MW by installing a number of single jet Pelton wheels whose specific speed is not to exceed 37.5. The other data required is : 15

Wheel speed = 750 rpm

Ratio of bucket to jet speed = 0.47

Overall efficiency of wheel = 70%

For nozzle $C_d = 0.94$ and $K_v = 0.96$

Friction Co-efficient $f = 0.005$. Determine jet diameter and diameter of supply pipes.

3. (a) Obtain an expression for unit speed, unit discharge and unit power for a turbine. 8

(b) Describe briefly the function of various main components of pelton turbine with neat sketches.

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SECTION – B

4. Explain construction, working principal and design parameters of Francis turbine with neat and clean diagram. 15

5. (a) A Kaplan turbine working under a head of 30 m develops 15000 KW shaft power. The outer diameter of runner is 3 m and hub diameter is 2.5 m. The guide blade angle is 35° . The hydraulic and overall efficiencies are 85% and 80% respectively, if velocity of whirl is zero at inlet. 10
- (b) What is draft tube ? Why is it used in a Reaction turbine ? Describe with sketches two different types of draft tubes. 5

SECTION – C

6. (a) Describe Rayleigh's method for dimensional analysis. 10
- (b) Define Reynold's number, Froude's number and Mach's number. What are their significances for fluid flow problems ? 5
7. Explain components parts, construction and operation of a centrifugal pump. Also discuss classification of centrifugal pumps. 15

SECTION – D

8. Explain the term negative slip as used in connection with the working of a Reciprocating pump. Why and when negative slip occurs ? A double acting reciprocating pump, having cylinder diameter of 15 cm and stroke 30 cm, is used to raise water through a

height of 40 m. if the pump is working at 90rpm and the pump efficiency is 80%, what is the power required to drive the pump ? Neglect the effect of piston rod area. 15

9. Explain the following : 15

- (a) Hydraulic Accumulator
 - (b) Hydraulic Intensifier
 - (c) Torque Converter
 - (d) Fluid Coupling
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