Time 70 mins

IET DAVV
BE III Mechanical Engineering
MER6C3 Fluid Mechanics
Test III

Max Marks 20

Answer all FOUR Questions. Answer should be clearly written with complete figures wherever required

1	Draw the following characteristics of Francis Turbine (a) Main Characteristic Curve (2) Operating Characteristics Curve (c) Muschel Curves.	5
2	Define Water hammer. List the methods to minimise it.	5
3	Explain all Characteristics curve of Centrifugal Pump.	5
4	A Centrifugal Pump is running at a speed of 1000 r.p.m. The outlet vane angle of the impeller is 45° and velocity of flow at outlet is 2.5 m/s. the discharge through the pump is 200 liter/ second when the pump is working against a total head of 20 meter if the manometric efficiency is 80%. Determine the Diameter of the impeller and the width of the impeller at outlet.	5

4	a.	Define Cavitations and what are types of cavitations?	6
	b	What are the cavitations effects in pumps and turbines, and what are its prevention?	6
	c.	Define Thoma-cavitation factor.,what are factor apparatus for cavitations test	6
5	a.	Explain Physical phenomenon of water hammer and its Prevention.	6
	b.	Derive the relation for Pressure Growth due to quick close valve of the elastic pipe?	6
	c.	Explain Surge Tank and its operation in Hydro-Plant?	6

III B.E Examination May, 2022 **2022095**

Mechanical Engineering

MER6C3 Fluid Machines

Time: 3 Hrs **Max. Marks: 60**

Note: Attempt any Two parts of All Questions. Answers should be neatly and clearly written.

1. a. What are the Dimensionless numbers and give their Significance and explain different similarities in dimensional analysis 6

   b. Using the method of dimensional analysis obtain an expression for the resistance experienced by a partially submerged body depends up on the velocity, length of the body, viscosity of the fluid, density of the fluid and gravitational acceleration. 6

   c. A 2.5m ship model was tested in fresh water (density 100kg/m^3) and measurements indicated that there was a resistance of 45N when the model was moved at 2m/s. Work out the velocity of 40m prototype, also calculate the force required to drive the prototype at this speed through sea water (density 1025kg/m^3) 6

2 a. Explain Draft Tube and what are the uses of draft tube? 6

   b. The hub diameter of a Kaplan turbine a head of 12 m, is 0.35 times the diameter of the runner. The turbine is running at 100 r.p.m. If the vane angle of the extreme edge of the runner at outlet is 15° and flow ratio is 0.6. Calculate 6
   1 Diameter of the runner
   2 Diameter of the boss
   3 Discharge through the runner
   Assuming Velocity of whirl at outlet is zero.

   c. A jet of water having a velocity of 45 m/s impinges without shock on a series of vanes moving at 15 m/s. the direction of motion of the vanes in inclined at 20° to that of the jet the relative velocity at outlet is 0.9m/s of that at inlet, and the absolute velocity of the water at exist is to be normal to the motion of vanes. 6
   Find (i) the vane angles at entrance and exists
   (ii) work done on vanes per kg of water supplied by the jet
   (iii) Hydraulic efficiency

3 a. A Centrifugal Pump is running at a speed of 1000 r.p.m. The outlet vane angle of the impeller is 45° and velocity of flow at outlet is 2.5 m/s. the discharge through the pump is 200 liter/ second when the pump is working against a total head of 20 meter if the manometric efficiency is 80%. Determine the Diameter of the impeller and the width of the impeller at outlet. 6

   b. A Centrifugal Pump having an overall efficiency is 72%. Delivers 0.03m^3/s of water to a height of 20m through a 10 cm diameter pipe 80m long. Taking friction coefficient 0.01. Calculate the power required to run the pump. 6

   c Explain Centrifugal Pump and their parts with suitable diagram. 6

Time 70 mins

IET DAVV

Max Marks 20

BE III Mechanical Engineering

MER6C3 Fluid Machines

Test II

Answer any FOUR Questions. Answer should be clearly written with complete figures wherever required

1 Write the 5 **important** differences between impulse and reaction turbines 5

2 Draw a chart showing all the losses (starting from gross head at head race to tail race) and efficiencies in a radial flow reaction turbines installations 5

3 A reaction turbine works under a head of 115 m running at 450 rpm. The diameter of the inlet is 1.2 m and the flow area is 0.4 m^2. At the inlet the absolute and relative velocities make angles of 20° and 60° respectively with peripheral velocity. Determine (a) the Power developed (b) hydraulic efficiency. Assume the velocity of whirl at the outlet to be zero. 5

4 Explain Dimensionless parameters and what are the applications 5

5 A 2.5m ship model was tested in fresh water (density 100kg/m^3) and measurements indicated that there was a resistance of 45N when the model was moved at 2m/s. Work out the velocity of 40m prototype, also calculate the force required to drive the prototype at this speed through sea water (density 1025kg/m^3) 5

Mathematics

Efficiency Mathematics

Mathematics

Mathematics

III B.E Examination May, 2022 **2022095**

Mechanical Engineering

MER603 Fluid Machines

Time: 3 Hrs **Max. Marks: 60**

Note: Attempt any Two parts of All Questions. Answers should be neatly and clearly written.

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IET DAVV
BE III Mechanical Engineering
MER6C3 Fluid Machines
Test II

Max Marks 20

B202 – 24

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IET DAVV
BE III Mechanical Engineering
MER6C3 Fluid Machines
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4 A centrifugal pump delivers water against a net head of 10 m at a design speed of 1000 rpm. The vanes are curve backwards and make an angle of 30° with the tangent to the outer periphery. The impellor diameter is 30 cms and has a width of 5 cms at the outlet. Determine the discharge of the pump if manometric efficiency is 95% 5

5 Draw the following characteristic curves of Francis Turbine. (a) Main characteristic Curves (b) Iso-efficiency curves 5

Time 70 mins

IET DAVV
BE III Mechanical Engineering
MER6C3 Fluid Machines
Test III

Max Marks 20

Answer any FOUR Questions. Answer should be clearly written with complete figures wherever required

1 Define Cavitations. Where does it occur in (1) Centrifugal Pump (2) Draft Tube (3) Aerofoils Show its effect on performance of a centrifugal pump 5

2 Define water hammer. Explain the process by neat sketch. 5

3 Define specific Speed of Pump and turbines. Write the significance of the same. 5

4 A double action Reciprocating pump of bore 100mm and stroke 200mm is provided at a height of 3.50 meter above the sump level. The crank connecting rod ratio is ¼ the suction pipe is 6 meters long and 75mm in diameter. Find the speed at which separation will occur. take HSEP = 2.5 meters 5

5 Explain reciprocating pump with effect of acceleration and friction of indicator diagram 5

Time 70 mins | IET DAVV | Max Marks 20

BE III Mechanical Engineering

MER6C3 Fluid Machines

Test I

Answer any FOUR Questions. Answer should be clearly written with complete figures wherever required

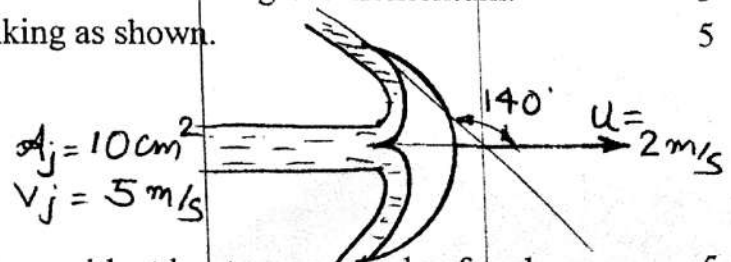
1 A 1/6 scale model of a passenger car is tested in a wind tunnel the prototype velocity is 60 km/h if the model drag is 250 N, what is the drag and power required to overcome the drag in the prototype. The air in the model and prototype can be assumed to have the same properties 5

2 Determine the dimensions of the following quantities (a) $\rho u \frac{\partial u}{\partial x}$ (b) $\int_1^2 (p - p_o) dA$ 5

(c) $\rho c_p \frac{\partial^2 T}{\partial x \partial y}$ (d) $\iiint \rho \frac{\partial u}{\partial t} dx dy dz$ (e) $\nabla . V$

3 Write the Reynold's transport theorem applied to linear and angular momentum. 5

4 Find the force on the plate with water jet striking as shown. 5



5 Write the classification of fluid machines along with at least one example of each 5