2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
HYDRAULIC MACHINERY AND SYSTEMS
(MECHANICAL ENGINEERING)

NOVEMBER 2006

TIME - 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1. *(a) Explain the jet propulsion of ships with neat sketches.*

(b) A ship whose resistance is 25000 N is to be driven at 5 m/s by means of a jet of water directed under water. The velocity of the jet is to be 7.5 m/s relative to the ship. The efficiency of the pump operating the jet is estimated to be 80%, the frictional resistance of the pipes being equal to 3 m of water. Calculate

i. the HP required to drive the pump

ii. the over all efficiency of the system when the water enters the ship through an inlet facing ahead.   [6+10]

2. Sketch a Francis turbine and explain clearly its working principle. Under what circumstances will it be a good choice.   [16]

3. A model of a Francis turbine one-fifth of full size, develops 30.8 KW at 305 rpm, under a head of 2.5 m. Find the speed and power of full size turbine operating under a head of 6 m   [16]

4. (a) Derive an expression for pressure head in the cylinder during suction stroke of a reciprocating pump with air vessel..

(b) A single acting reciprocating pump has a plunger diameter of 250 mm and stroke length of 450 mm. The suction pipe is 125 mm diameter and 12 m long with a suction lift of 3 metres. An air vessel is fitted to the suction pipe at a distance of 1.5 m from the cylinder and 10.5 m from the sump of water level. If the barometer reads 10.0 m of water and separation takes place at 2.5 m vacuum, find the speed at which the crank can operate without separation to occur. Take f = 0.01   [10+6]

5. (a) What is the basic principle applied to find the work done on water in centrifugal pump? Explain in detail.

(b) A centrifugal pump delivers water against a net head of 10 m at a speed of 1000 rpm. The vanes are curved backward and make an angle of 30 degrees.The impeller outside diameter is 30 cm and has a width of 5 cm at the outlet. Determine the discharge if manometric efficiency is 95%. [8+8]

6. (a) What do you understand by multistage pump? When do you use them?

(b) What do you understand by pumps in parallel? When do you connect the pumps in parallel ?

7. (a) Describe with neat sketch the working of a hydraulic press.

(b) A hydraulic press has diameter of ram 200 mm and of plunger 40 mm. It is provided with a lever for applying force to the plunger. If the ratio of leverage is 10, determine the weight lifted by the press, when the force applied to the level is 100 N.   [6+10]

8. Explain different types of fluid control valves with neat sketches.