2122
B. E. (Mechanical Engineering)
Fifth Semester
MEC-506: Fluid Machinery

Time allowed: 3 Hours   Max. Marks: 50

NOTE: *Attempt __five__ questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

Q.1 a) Why Pelton wheel not possess any draft tube?

b) What is a draft tube? Name types of draft tube.

c) Draw an indicator diagram of a reciprocating pump fitted with air vessel.

d) How is the selection of pump is made?

e) Define specific speed of turbine and pump.   (02x05=10)

Part-A

Q.2 a) A water jet with a velocity of 40m/s strikes a blade moving with 20m/s. The jet makes an angle of 30^0 and 120^0 at the inlet and outlet of the blade. Draw velocity triangles and **Find:** the inlet and outlet blade angles so that water enters and leaves the blade without shock; work done per kg of water. Neglect the loss due to friction in the blade passage.   (04)

b) A Pelton wheel is to be designed for the following specifications: power=9560kW; head=350m; speed=750rpm; overall efficiency=85%; jet diameter=not to exceed $1/6^{th}$ of the wheel diameter. **Find:** Wheel diameter; diameter of the jet; the number of jets required. Take: Cv=0.985 and speed ratio=0.45   (06)

Q.3 a) An inward flow reaction turbine is supplied 0.233m³/s of water under a head of 11m. The wheel vanes are radial at inlet and the inlet diameter is twice the outlet diameter. The velocity of flow is constant and equal to 1.83m/s. The wheel makes 370rpm. **Find:** Guide vane angle; inlet and outlet diameters of wheel; width of wheel at entry and exit. Assume radial discharge and there are no losses in wheel. **Take:** speed ratio=0.7 and neglect thickness of the vanes.   (06)

b) What is governing and how it is accomplished for Francis turbine?   (04)

Q.4 a) Write a note on Pump noise; compressor and turbine noise.   (05)

b) What do you mean by the Cordier diagram? Discuss six regions of the Cordier diagram.   (05)

Part-B

Q.5 A centrifugal pump, in which water enters radially, delivers water to a height of 165mm. The impeller has a diameter of 360mm and width 180mm at inlet and the corresponding dimensions at the outlet are 720mm and 90mm respectively; its rotational speed is 1200rpm. The blades are curved backward at 30^0 to the tangent at exit and the discharge is 0.389m³/s. **Find:** theoretical head

developed; manometric efficiency; pressure rise across impeller assuming losses equal to 12% of velocity head at exit; pressure rise and the loss of head in the volute casing; and the vane angle at inlet.   **(10)**

Q. 6 a) A model turbine constructed to a scale of 1:10 when tested under a head of 8m at 400rpm gave an efficiency of 77%. **Find** the rpm of the prototype and the ratio of powers developed by the model and prototype if the prototype works under a head of 100m.   **(05)**

b) Write short note on: Air lift pump and Vane pump.   **(05)**

Q.7 The piston diameter and stroke length of a double-acting single cylinder reciprocating pump are 150mm and 300mm respectively. The centre of the pump is 4.5m above the water level in the sump and 32m below the delivery water level. Both the suction and delivery pipes have the same diameter of 75mm and are 6m and 36m long respectively. If the pump is working at 30rpm **determine:** the pressure heads on the piston at the beginning, middle and end of both suction and delivery strokes; the power required to drive pump if the mechanical efficiency is 80%; Take atmospheric pressure head=10.3m of water and f=0.01.   **(10)**

x-x-x