

<b>Seat</b>	
<b>No.</b>	

**S. Y. B. Tech. (CBCS) (Part II) (Semester IV)****Examination, May - 2025****Fluid and Turbo Machinery****Sub. Code : 79121 / 63362 / 79409****Day and Date : Monday, 19/05/2025****Total Marks : 70****Time : 10.30 a.m. to 1.00 p.m.**

- Instructions :**
- i) Question number 4 and 8 are compulsory.  
Attempt any Two from question number 1, 2, 3.  
Attempt any Two from question number 5, 6, 7.**
  - ii) Figures to the right indicate full marks.**
  - iii) Assume suitable data if necessary.**
  - iv) Use of non-programmable calculator is allowed.**
  - v) Use of steam table is allowed.**

**Q.1 Attempt the following questions [10]**

- a. Explain Euler's equations for Rotodynamic machine.
- b. Explain the construction and working of Pelton wheel turbine.

**Q.2 Attempt the following questions. [10]**

- a. Explain the construction and working of Francis turbine.
- b. Explain the difference between impulse and reaction turbine.

**Q.3 Attempt the following questions. [10]**

- a. Define and classify pumps.
- b. Draw and explain velocity triangle diagram for centrifugal pump.

**Q.4 Attempt Any Two from the following questions.****[8]**

- a. A pelton wheel is to be designed for the following specifications, Shaft Power = 11772 kW, Head = 380 m, Speed = 750 r.p.m., Overall efficiency = 86 %. Jet diameter is not exceeded  $(1/6)^{\text{th}}$  of the diameter of wheel.

Determine,

- i) Diameter of wheel
- ii) Diameter of wheel and jet
- iii) Number of jet required
- iv) Also draw velocity triangle diagram

Assume, Coefficient of velocity is 0.985 and Speed ratio is 0.45.

- b. The following data is given for a francis turbine, Net head  $H = 60$  m, Speed  $N = 700$  r.p.m.; shaft power = 294.3 kW, Overall efficiency = 84%; hydraulic efficiency = 93%; flow ratio = 0.20: breadth ratio  $n = 0.1$ , Outer diameter of the runner = 2 times inner diameter of runner. The thickness of vanes occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine :

**[8]**

- i) Guide blade angle
- ii) Runner vane angle at inlet and outlet
- iii) Diameter of runner at inlet and outlet
- iv) Width of wheel at inlet

- c. A centrifugal pump is running at speed 1550 rpm and discharge is  $0.220 \text{ m}^3/\text{s}$  against a head of 27 m. The impeller diameter is 300 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. **[8]**

**Q.5. Attempt the following questions.****[10]**

- a. What is Compressor? What are the applications of compressed air?
- b. Write a short note on intercooler and aftercooler.

**Q.6. Attempt the following questions.** [10]

- a. Describe the function of impeller and diffuser in a centrifugal compressor.
- b. Explain with a neat sketch working of axial flow compressor.

**Q.7. Attempt the following questions.** [10]

- a. What are the applications of gas turbine?
- b. Explain with a neat sketch open cycle gas turbine.

**Q.8. Attempt Any Two from the following questions.**

- a. A single cylinder air compressor is required to compress 1 Kg of air from 1 bar to 5 bar. The initial temperature is 28°C. Compare the work done in the following cases with  $R=0.287 \text{ kJ/KgK}$  [7]
    - i. Isothermal Process
    - ii. Polytropic Process  $pV^{1.2} = \text{Constant}$
  - b. A rotary compressor working between 1 bar and 2.5 bar has internal and external diameters of impeller as 300 mm and 600 mm respectively. The vane angle at inlet and outlet are 30° and 45° respectively. If the air enters the impeller at 15 m/s. Find the speed of impeller in rpm and work done by compressor per kg of air. [7]
  - c. A constant pressure open gas cycle turbine plant works between temperature 15°C and 700°C and pressure ratio of 6. Find the mass of air circulating in the installation, if it develops 1100 kW. Also find the heat supplied by the heating chamber. [7]
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