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BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – B.Tech.(ME)-2021/B.Tech.(CE)]-2021/B.Tech.(ME)-2023

Course Name – Fluid Machinery

Course Code - PCC-ME403

(Semester IV)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the fundamental law of physics that forms the basis of the impulse-momentum principle.
 - a) Newton's First Law
 - b) Newton's Second Law
 - c) Newton's Third Law
 - d) Law of Conservation of Energy
- (ii) Identify the fundamental concept that the impulse-momentum principle describes.
 - a) Conservation of mass
 - b) Relationship between force, time, and momentum
 - c) Conversion of kinetic energy into potential energy
 - d) Law of fluid pressure
- (iii) Calculate the impulse imparted if the force of 50 N is applied to a body for 4 seconds.
 - a) 10 Ns
 - b) 20Ns
 - c) 50Ns
 - d) 200Ns
- (iv) Identify the SI unit of impulse.
 - a) Newton (N)
 - b) Joule (J)
 - c) Newton-second (Ns)
 - d) Watt (W)
- (v) Define the main function of a centrifugal pump.
 - a) Convert mechanical energy to pressure energy
 - b) Convert kinetic energy to thermal energy
 - c) Convert chemical energy to mechanical energy
 - d) Convert electrical energy to pressure energy
- (vi) Recognize the component responsible for increasing the velocity of fluid in a centrifugal pump.
 - a) Impeller
 - b) Diffuser
 - c) Volute
 - d) Shaft
- (vii) Identify the main classification of steam turbines.
 - a) Impulse and Reaction
 - b) Axial and Radial

- c) Single and Multistage

(viii) Determine the effect of blade friction losses in a steam turbine.

a) Reduces efficiency
c) Has no effect on efficiency

(ix) Define the working principle of a compressor.

a) Increases pressure by reducing volume
c) Maintains constant pressure

(x) Identify the main classification of compressors.

a) Positive displacement and dynamic
c) Single-stage and multi-stage

(xi) Select the key difference between a fan and a blower.

a) Fan moves air at low pressure, blower moves at medium pressure
c) Fan creates vacuum, blower creates pressure

(xii) Describe the significance of the enthalpy-entropy diagram in compressor performance.

a) Shows energy transformation during compression
c) Shows entropy change

(xiii) Relate efficiency to the degree of reaction in compressors.

a) Higher degree of reaction improves efficiency
c) Efficiency is independent of reaction

(xiv) Determine the significance of slip in compressor performance.

a) Reduces overall efficiency
c) Improves compressor stability

(xv) Evaluate the impact of choking on compressor performance.

a) Limits maximum airflow
c) Has no significant impact

d) Low and High-Speed

b) Enhances turbine operation
d) Increases energy losses

b) Increases volume by reducing pressure
d) Increases kinetic energy only

b) Axial and Radial
d) Centrifugal and reciprocating

b) Fan moves air at high velocity, blower moves at low velocity
d) Both operate at the same pressure level

b) Determines energy efficiency
d) Has no relevance to performance

b) Lower degree of reaction increases losses
d) Reaction degree has no relation to efficiency

b) Has no significant effect
d) Improves overall efficiency

b) Improves compressor operation
d) Determines efficiency variation

Group-B

(Short Answer Type Questions)

 $3 \times 5 = 15$

2. Established the various characteristic curves of a centrifugal pump. (3)
3. Determine the factors affecting the efficiency of a centrifugal pump. (3)
4. Classify hydraulic turbines based on their working principles. (3)
5. Explain the concept of specific speed and its importance in turbine selection. (3)
6. Determine the power output of a steam turbine with a mass flow rate of 5 kg/s and an enthalpy drop of 850 kJ/kg. (3)

OR

A steam turbine operates at an inlet velocity of 300 m/s and an exit velocity of 150 m/s. (3)
Determine the work done per unit mass flow rate.

Group-C

(Long Answer Type Questions)

 $5 \times 6 = 30$

7. Explain the working principle of a centrifugal pump using a labeled diagram. (5)
8. Compare the performance characteristics of the fan and blower. (5)
9. Describe the theory of draft tube in reaction turbine and how the turbine performance is affected in the absence of draft tube. (5)
10. Describe various efficiencies of turbines and their significance. (5)

11. Calculate the specific speed of a turbine with a discharge of $8 \text{ m}^3/\text{s}$, head of 50 m, and running at 750 RPM. (5)
12. Differentiate between axial flow pumps and centrifugal pumps based on design, working, and applications. (5)

OR

A centrifugal pump delivers 50 L/s of water against a head of 40m with an efficiency of 75%. Compute the required power input. (5)

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