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## BRAINWARE UNIVERSITY

**Term End Examination 2025-2026**

**Programme – Dip.ME-2023**

**Course Name – Power Engineering**

**Course Code - DMEPC602**

**( Semester VI )**

**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 type of engine that primarily uses the Otto cycle.
  - a) Diesel engine
  - b) Petrol engine
  - c) Gas turbine engine
  - d) Steam engine
- (ii) Define the key function of a catalytic converter.
  - a) Increase the engine efficiency
  - b) Reduce emissions of harmful gases
  - c) Improve fuel consumption
  - d) Increase engine power
- (iii) State the number of strokes required to complete one cycle in a four-stroke engine.
  - a) One
  - b) Four
  - c) Three
  - d) Two
- (iv) Describe the purpose of scavenging in two-stroke engines.
  - a) To prevent fuel mixing
  - b) To increase the power output
  - c) To expel exhaust gases
  - d) To lubricate engine components
- (v) Describe the exhaust and intake process in a two-stroke engine.
  - a) Simultaneously
  - b) During separate strokes
  - c) In alternate cycles
  - d) Once every two cycles
- (vi) Explain the primary cause of detonation in an engine.
  - a) High air-fuel mixture
  - b) Low compression ratio
  - c) High combustion chamber temperature
  - d) Low engine speed
- (vii) Compare a hypothetical indicator diagram with an actual indicator diagram.
  - a) It accounts for frictional losses
  - b) It represents ideal conditions
  - c) It includes energy losses
  - d) It shows actual pressure values during compression
- (viii) Compare the operation of a two-stroke engine with a four-stroke engine.
  - a) It requires two rotations of the crankshaft to complete one cycle
  - b) It expels exhaust gases and draws in fuel during the same stroke

- c) It uses spark plugs for ignition  
 (ix) Explain the continuity equation for steady flow.  
 a) Mass flow rate is constant  
 c) Velocity is constant  
 (x) Explain the purpose of velocity diagrams in steam turbine analysis.  
 a) Determine the work done by the turbine  
 c) Measure the temperature rise  
 (xi) Calculate the relative velocity of steam entering the blade in a simple impulse turbine if the blade velocity is 200 m/s and the steam velocity is 500 m/s.  
 a) 300 m/s  
 c) 500 m/s  
 (xii) Name the type of propulsion system used in rockets.  
 a) Turbojet  
 c) Ramjet  
 (xiii) Describe the primary function of a draft tube in a hydraulic turbine.  
 a) Increase pressure at the outlet  
 c) Increase velocity at the outlet  
 (xiv) Construct a velocity diagram for a Francis turbine.  
 a) Mixed inlet and outlet velocities  
 c) Tangential inlet and radial outlet velocities  
 (xv) Select the following methods that can improve the efficiency of a steam power plant.  
 a) Using a single-stage turbine.  
 c) Increasing the condenser pressure.
- d) It operates only on gasoline  
 b) Pressure is constant  
 d) Temperature is constant  
 b) Calculate the pressure drop  
 d) Determine the mass flow rate  
 b) 400 m/s  
 d) 600 m/s  
 b) Turboprop  
 d) Rocket propulsion  
 b) Decrease pressure at the outlet  
 d) Decrease velocity at the outlet  
 b) Axial inlet and tangential outlet velocities  
 d) Radial inlet and axial outlet velocities  
 b) Implementing a binary vapor cycle.  
 d) Reducing the boiler temperature.

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#### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Define the working principle of a steam nozzle. (3)
3. Name the types of steam turbines based on the working principle. (3)
4. Explain the working principle of the Brayton cycle. (3)
5. Explain the working principle of a four-stroke petrol engine. (3)
6. Analyze the effect of regeneration on the thermal efficiency of a gas turbine. (3)

OR

- Analyze the effect of increasing the bypass ratio in a turbofan engine. (3)

#### Group-C

(Long Answer Type Questions)

5 x 6=30

7. Illustrate the effectiveness of using natural gas versus diesel fuel in gas turbines. Explain the economic and environmental implications of this choice. (5)
8. List the main components of a four-stroke diesel engine and briefly describe their functions. (5)
9. The following data obtained from single-cylinder four-stroke petrol engine test: Cylinder bore =150 mm Stroke length =200 mm Engine speed =500 rpm Mean Effective Pressure =8 bar Calculate Indicated Power developed by this engine clearly showing calculation steps involved. (5)
10. Assess the environmental impact of gas turbines compared to other power generation methods. Write strategies to reduce emissions from gas turbines. (5)
11. Analyze the advantages and disadvantages of open-cycle versus closed-cycle gas turbines in terms of efficiency and complexity. Compare their applications in power generation. (5)
12. Analyze and contrast the working principles of simple impulse and impulse-reaction steam turbines. (5)

OR

Evaluate the role of Mach number in determining the performance of steam nozzles and (5)  
discuss its impact on turbine efficiency.

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