KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.E.
Year : IV
Exam Roll No. :

Course : MEEG 441
Semester : I
Time: 30 mins.
F. M. : 20

Registration No.:

Date 04 FEB 2025

Students are ALLOWED to use Steam Table and Mollier Diagram.

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer and **encircle**.

1. Which processes do occur in the Brayton cycle?
   a. two reversible adiabatic processes and two reversible isochoric processes
   b. two reversible adiabatic processes and two reversible isobaric processes
   c. two reversible adiabatic processes and two reversible isothermal processes
   d. two reversible adiabatic processes and two reversible isentropic processes

2. For the same compression ratio, the efficiency of an air standard Otto cycle is
   a. More than the efficiency of an air standard Diesel cycle
   b. Less than the efficiency of an air standard Diesel cycle
   c. Equal to the efficiency of an air standard Diesel cycle
   d. None of the above

3. Consider a simple ideal Rankine cycle with fixed boiler and condenser pressures. If the steam is superheated to a higher temperature,
   a. the turbine work output will decrease
   b. the amount of heat rejected will decrease
   c. the cycle efficiency will decrease
   d. the moisture content at turbine exit will decrease

4. In a steam power plant, feed water heater is a heat exchanger to preheat feedwater by
   a. leave steam from steam generator
   b. hot flue gases coming out of the boiler furnace
   c. hot air from air preheater
   d. extracting steam from turbine

5. The enthalpy drop for flow through convergent horizontal nozzles is 100kJ/kg. If the velocity of approach at inlet to the nozzle is negligible, the exit velocity of the fluid is
   a. 20 m/s b. 400m/s c. 447.2m/s d. 520.8m/s

6. For maximum discharge through a convergent nozzle the pressure ratio $\frac{p_2}{p_1}$ should be (where n is the isentropic expansion index)
   a. $\left(\frac{n+1}{2}\right)^{\frac{n}{n-1}}$ b. $\left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$ c. $\left(\frac{n+1}{2}\right)^{\frac{n-1}{n}}$ d. $\left(\frac{2}{n+1}\right)^{\frac{n-1}{n}}$

7. The effect of friction in a steam nozzle is to
   a. increase velocity and increase dryness fraction
   b. increase velocity and decrease dryness fraction
   c. decrease velocity and increase dryness fraction
   d. decrease velocity and decrease dryness fraction

8. The main aim of compounding steam turbine is to
   a. improve efficiency
   b. reduce steam consumption
   c. reduce rotor speed
   d. reduce turbine size

9. The ratio of work done by the blades per kg of steam flowing through a set of fixed and moving blades, and the corresponding isentropic enthalpy drop is called
   a. Nozzle efficiency
   b. blade efficiency
   c. Stage efficiency
   d. relative efficiency

10. A single-stage impulse with a diameter of 120 cm runs at 3000 rpm. If the blade speed ratio is 0.42, then, the inlet velocity of steam will be
   a. 79 m/s b. 188 m/s c. 450 m/s d. 900 m/s

11. In an impulse-reaction turbine stage, the heat drop is fixed and moving blades are 15 kJ/kg and 30 kJ/kg respectively. The degree of reaction for this stage will be
   a. 1/3 b. 1/2 c. 2/3 d. ¾

12. In case of reaction steam turbine
   a. There is enthalpy drop only in moving blades.
   b. There is enthalpy drop only in fixed blades.
   c. There is enthalpy drop both in fixed and moving blades.
   d. There is no enthalpy drop in blades

13. For a jet propulsion unit, ideally the ratio of compressor work and turbine work is
   a. 2
   b. 1
   c. not related to each other
   d. unpredictable

14. In turbofan engine, the bypass ratio is the ratio of
   a. total mass flow rate of exhaust stream to the mass flow rate of stream from turbine exhaust
   b. total mass flow rate of exhaust stream to the mass flow rate of stream from fan exhaust
   c. the mass flow rate of stream from turbine exhaust to the mass flow rate of stream from fan exhaust
   d. the mass flow rate of stream from fan exhaust to the mass flow rate of stream from turbine exhaust

15. The power potential of a wind turbine at a wind speed of 5 m/s is 50 kW. The power potential of the same turbine at a velocity of 8 m/s is
   a. 128 kW b. 180 kW c. 205 kW d. 242 kW

16. The rotor blades stop to rotate
   a. At cut-in speed b. cut-out speed c. rated speed d. furling speed

17. In centrifugal pump, the fluid enters the pump
    a. From all sides
    b. through the top
    c. through the bottom
    d. through the center

18. In a single stage reciprocating air compressor, the work done on air to compressor is from suction pressure to delivery pressure will be minimum when the compression is
    a. Isothermal process
    b. Adiabatic process
    c. Polytropic process
    d. Isobaric process

19. In a two-stage reciprocating air compressor with a suction pressure of 2 bar and delivery pressure of 8 bar the ideal intercooler pressure will be
    a. 10 bar
    b. 6 bar
    c. 4 bar
    d. 3 bar

20. Which one of the following statements is correct?
    a. Reciprocating compressors are used to supply large quantities of air at a lower pressure ratio
    b. Centrifugal compressors are used to supply large quantities of air at a lower pressure ratio
    c. Centrifugal compressors are used to supply small quantities of air at a lower pressure ratio
    d. Centrifugal compressors cannot be run at high speed because of impeller, diffuser and casing.