Mansoura University Faculty of Engineering		جامعـــــــة المنصورة كليـــــة الهندســـــة
Biomedical Engineering Program		*Subject :Thermodynamics*
Level 100	*Academic year 2018-2019*	*Time: one hour*
Exam : mid Term	*Second Term*	*Course code: MPE172*

Answer the following questions. Assume any missing data.
Steam tables and charts are allowed

Questions (1) (3 – points)

Steam at 140 bar has an enthalpy of 3005.6 kJ/kg, using steam tables, find the temperature, the specific volume and the internal energy.

Questions (2) (6 - points)

Air at 1.02 bar, 22°C, initially occupying a cylinder volume of 0.015 m^3, is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar. Calculate: (i) The final temperature; (ii) The final volume; and (iii) The work done.

Questions (3) (6 - points)

At the inlet to a certain nozzle the enthalpy of fluid passing is 2800 kJ/kg, and the velocity is 50 m/s. At the discharge end the enthalpy is 2600 kJ/kg. The nozzle is horizontal and there is negligible heat loss from it. (i) Find the velocity at exit of the nozzle; (ii) If the inlet area is 900 cm^2 and the specific volume at inlet is 0.187 m3/kg, find the mass flow rate; and (iii) If the specific volume at the nozzle exit is 0.498 m3/kg, find the exit area of nozzle.

Questions (4) (5 - points)

Steam enters a steam turbine at a pressure of 15 bar and 350°C with a velocity of 60 m/s. The steam leaves the turbine at 1.3 bar and with a velocity of 180 m/s. Assuming the process to be reversible adiabatic, determine the steam conditions at turbine outlet, and the work done per kg of steam flow through the turbine. Neglect the change in potential energy.

P. T. O.

Question (5) (5-points)

Choose the correct answer:

1) An open system is one in which
   (*a*) heat and work cross the boundary of the system, but the mass of the working substance does not
   (*b*) mass of working substance crosses the boundary of the system but the heat and work do not
   (*c*) neither the heat and work nor the mass of the working substances cross the boundary of the system.
   (*d*) both the heat and work as well as mass of the working substances cross the boundary of the system.

2) An isolated system
   (*a*) is a specified region where transfer of energy and/or mass take place
   (*b*) is a region of constant mass and only energy is allowed to cross the boundaries
   (*c*) cannot transfer either energy or mass to or from the surroundings
   (*d*) is one in which mass within the system is not necessarily constant
   (*e*) none of the above

3) A series of operations, which take place in a certain order and restore the initial condition is known as
   (*a*) Reversible cycle
   (*b*) Thermodynamic cycle
   (*c*) Irreversible cycle
   (*d*) None of the above

4) The latent heat of vapourisation at critical point is
   (*a*) Less than zero
   (*b*) Greater than zero
   (*c*) Equal to zero
   (*d*) None of the above

5) Critical point involves equilibrium of
   (*a*) solid and vapour phases
   (*b*) solid and liquid phases
   (*c*) solid, liquid and vapour phases
   (*d*) liquid and vapour phases

6) With the increase in pressure,
   (*a*) boiling point of water increases and enthalpy of evaporation increases
   (*b*) boiling point of water increases and enthalpy of evaporation decreases
   (*c*) boiling point of water decreases and enthalpy of evaporation increases.

7) Internal energy of a perfect gas depends on
   (*a*) temperature, specific heats and pressure
   (*b*) temperature, specific heats and enthalpy
   (*c*) temperature, specific heats and entropy
   (*d*) temperature only.

8) An isentropic process is always
   (*a*) reversible and adiabatic
   (*b*) reversible and isothermal
   (*c*) frictionless and irreversible
   (*d*) irreversible and adiabatic
   (*e*) none of the above.

9) The processes or systems that do not involve heat are called
   (*a*) isothermal processes
   (*b*) equilibrium processes
   (*c*) thermal processes
   (*d*) steady processes
   (*e*) adiabatic processes

10) During throttling process
   (*a*) internal energy does not change
   (*b*) pressure does not change
   (*c*) entropy does not change
   (*d*) enthalpy does not change
   (*e*) volume change is negligible