1. A fluid at a pressure of 3 bar and with specific volume of 0.18 m³/kg, contained in a cylinder behind a piston expands reversibly to a pressure of 0.6 bar according to the law $V^2 = \dfrac{C}{P}$ where C is a constant. Work done by the fluid on the piston is:-

   (a) 29.85 KJ/kg   (b) 39.85 KJ/kg

   (c) 19.85 KJ/kg   (d) zero

2. Air enters into a gas turbine at 40 bar, 1047^0C with velocity 200 m/s. It flows adiabatically and leaves turbine at 1 bar. The turbine output (in kW) is_____.

   $(\dot{m} = 1kg/s, c_p = 1.05kJ/kg - K,$

   $\gamma = 1.4$)

3. The diagram shown in figure represents reversible compression of air on P-V coordinates. The work of compression needed by a centrifugal compressor is equal to the area:
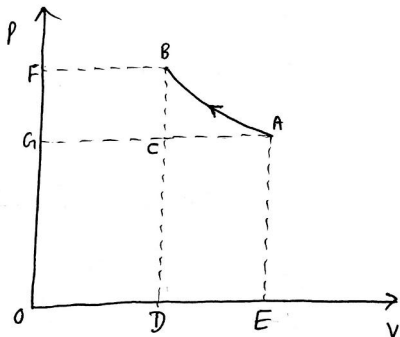
   (a) ABDE-ABC   (b) ABDE

   (c) ABFG   (d) ABFG-ABC

4. The internal energy of a certain system is a function of temperature alone and is given by the formula $E = (25 + 0.25t)kJ$. If this system executes a process for which work done by it per degree temperature increase is 0.75 KN-m, the heat interaction per degree temperature increase, in kJ is:

   (a) -1.00   (b) -0.50

   (c) 0.50   (d) 1.00

5. When temperature of an isolated system having ideal gas is increased. Which of the following takes place?
   (a) Expansion   (b) Compression
   (c) Cooling   (d) none of these

6. Expansion work is maximum in case of:

   (a) Isochoric process
   (b) Isobaric process
   (c) Isothermal process
   (d) Adiabatic Process

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Common data for Q7 and Q8

170 kJ of heat is supplied to a system at constant volume, then the system rejects 180 kJ of heat at constant pressure and 40 kJ of work is done on it. System is finally brought to its original state by adiabatic process. If the initial value of internal energy is 100 kJ, then:

7. Value of internal energy at the end of constant pressure process is:-
(a) 270 kJ   (b) -140 kJ
(c) 130 kJ   (d) zero

8. Change in internal energy when system returns to original state 1 is-:
(a) 100 kJ   (b) zero
(c) 270 kJ   (d) 130 kJ

9. A spherical balloon of 3m initial diameter is filled with air at 120 kPa and 35^0C. Air enters this balloon at 120 KPa and 35^0C with a velocity of 2m/s through a 1m diameter opening. If the pressure and temperature of the air in the balloon remain the same as the air entering the balloon, how many minutes will it take to inflate this balloon to 15m diameter?
(a) 9.3 minutes   (b) 18.6 minutes
(c) 13.9 minutes   (d) 23.3 minutes

10. A 0.75m diameter fan takes air in at 98 kPa, 22^0C and delivers it at 105 kPa, 23^0C with a velocity of 1.5m/s. If gas constant for air is R=0.287 kJ/kg, the mass flow rate and inlet velocity respectively are:-
(a) 0.41 kg/s, 1.2 m/s
(b) 1.64 kg/s, 2.4 m/s
(c) 1.23 kg/s, 2 m/s
(d) 0.819 kg/s, 1.6 m/s

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