

B.TECH 3rd SEM MIDTERM EXAMINATION, 2019

Subject Name: Engineering Thermodynamics.

Subject Code: UPE03B05

Full Marks: 50

Time: 1 hour.

All questions are compulsory

Group A

(25)

1. Define *Thermodynamics*.
2. What do mean by *Heterogeneous* system?
3. How *bond energy* is a *negative* phenomenon?
4. Which of the following are *intensive* or *extensive* property of system?
Volume, entropy, enthalpy, temperature, pressure, internal energy
5. Write down the *zeroth law* of thermodynamics.

Group: B

(Answer any five questions)

(Se5)

1. A gas is initially at 150 kPa and occupies a volume of 0.03 m^3 of a piston-cylinder arrangement. To increase the volume of the gas upto 0.1 m^3 it has been heated. Find the workdone on or by the system if the square of volume is inversely proportional to the pressure.

Mr. Subir Ghosh is driving his Maruti Wagon R of 825 kg with his mother, wife and healthy new born baby. The car is running at a speed of 50 km/hr. Masses of the Mr. & Mrs. Ghosh and his mother are 74 kg, 48 kg and 51 kg respectively. Suddenly a truck has arrived in front of their car and Mr. Ghosh has applied the brakes and the vehicle is brought to rest. Calculate the rise in the temperature of the brakes if their mass is 15 kg. Take specific heat of the material of brakes = 0.45 kJ/kg K.

1. A gas having 1.65 kg/m^3 mass density is at 288 K temperature and 100 kPa pressure. To raise its temperature from 20°C to 300°C , 0.8 kg of this gas requires 250 kJ of heat under isobaric condition. Determine specific heat at constant volume and pressure, characteristics gas constant, work-done by or on the system and change of enthalpy. (5)
2. A perfect gas flows through a nozzle where it expands in a reversible adiabatic manner. The inlet conditions are 22 bar , 500°C , 38 m/s , at exit the pressure is 2 bar . Determine the exit velocity and area if flow rate is 4 kg/s . Take $R = 190 \text{ J/kg K}$ and $\gamma = 1.35$. (5)
3. Draw the steady flow energy equation for Nozzle and Diffuser. (5)
4. Write down First Law for Cyclic Process. What are the different corollaries of First Law of Thermodynamics? What do you mean by Isentropic process? (2+2+1)
5. Derive the equation for Polytropic Heat Interaction. Also prove that $C_p = \frac{dh}{dT}$. (5)

Group C

(7x1)

- ① In a cylinder of 50 litres contain an ideal gas at 300 K temperature and 1.2 bar pressure. By using piston the gas is compressed adiabatically to 15 bar. The system is then cooled isochorically and further expanded at constant temperature to get back the system at its initial state. Determine pressure after the completion of the second step, change in internal energy during isochoric process, net work done and heat transfer during the cycle. Assume $C_p = 14.25 \text{ kJ/kg K}$ and $C_v = 10.15 \text{ kJ/kg K}$. (7X1) (7)

Group: D

$$y_0 = 0$$

(8x1)

- ✓ Prove any two of the followings that

any two of the followings that

- stored energy is a property of the system,
- $C_p - C_v = R$
- $TV^{\gamma-1} = \text{Constant}$

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$$B \quad \frac{P_1}{T_1} = \frac{P_2}{T_2} \quad PV = nRT$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad (4+4)$$

$$CP - CV$$

Group: E

✓ 1. First law of thermodynamics deals with

- a. Conservation of heat; b. Conservation of momentum;
c. Conservation of mass ✓ d. Conservation of energy

✓ 2. The value of c_p/c_v for air is

- a. 1; ✓ b. 1.4; c. 1.8; d. 2.3.

✓ 3. A system comprising of a single phase, is known as

- a. Open system; b. Closed system;
c. Homogeneous system; d. Heterogeneous system.

✓ 4. The measurement of thermodynamic property known as temperature, is based on

- ✓ a. Zeroth law of thermodynamics; b. First law of thermodynamics
c. Second law of thermodynamics; d. None of the above

✓ 5. In the polytropic equation, $pV^n = \text{constant}$, if value of n is infinite, then process is called

- a. Constant pressure process; b. Constant volume process;
c. Constant temperature process; ✓ d. None of the above.

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$$pV = RT$$

$$d(pV) = d(RT)$$

$$p dv + v dp = R dT$$

$$p dv + v dp = \cdot$$

Enrollment No.

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S, UPE03B13PE

B. Tech 3rd Semester, Mid Term Examination-2019
Fluid Mechanics and Machine (UPE03B13)

Time: 2 hrs.

Full Marks: 50

Answer any five questions:-

1. ☒ (i) Define :- (a) Fluid Continuum, (b) Surface Tension, (c) Capillarity, (d) Specific Weight, (e) Compressibility Factor.
☒ (ii) A 200 mm diameter shaft is rotating at 120 rpm in a bearing of length 250 mm. If the thickness of oil film is 1.2 mm and the viscosity is 4.25 Poise, determine: (i) Torque required overcoming friction. (ii) Power utilizing in overcome viscous resistance. (5+5)
2. ☒ (i) State and derive the Pascal's law.
☒ (ii) Differentiate in between Mechanical Advantage to Mechanical Efficiency. The diameter of ram and plunger of a hydraulic press are 250 mm and 20 mm respectively. Find the weight lifted by the hydraulic press when the force applied at the plunger is 0.75 kN. Also find the mechanical advantage of hydraulic press. (5+5)
3. ☒ (i) Prove that, for 3-D fluid flow- $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$.
☒ (ii) Define, Stream Line, Streak Line and Path Line. (7+3)
4. ☒ (i) What is Barometer? Why mercury is as a manometric fluid in manometer?
☒ (ii) With neat sketch draw the Rheological diagram. Deduce the expression of Bernoulli's equation. (3+7)
5. ☒ (i) What is differential manometer? Derive the expression of differential manometer, $P_1 - P_2 = \gamma \cdot h (1 - S_1/S_2)$.
☒ (ii) Find the standard expression of Reynolds No. (7+3)
6. ☒ (i) Define: (a) Steady and uniform Flow (b) Reynolds and Navier-Stoke expression (C) The velocity in a flow field is given by:- $V = 2x i + 3y j - 4z k$. Determine the stream line equation passing through the point (1,1,2).
☒ (ii) (a) What is the physical significance of Bernoulli's expression? (6+3)

PAV

Enrollment No. 18444037

S₃ UPE03B03/PE

B.Tech 3rd Semester, MID Term Examination, 2019
NAME OF SUBJECT: MANUFACTURING PROCESS -I
CODE NO:- UPE03B03

Full Marks: 50

Time: 2 hours

The figures in the margin indicate full marks for the questions

Candidates are required to give their answers in their own words as far as practicable

Answer any FIVE questions

- 1) (a) Write about pattern, types of pattern and pattern materials 5
(b) Discuss about pattern allowances 5
2) (a) Discuss about moulding materials and types of moulding 5
(b) Explain about the additives used to improve the mould performance. 5
3) (a) Explain the Modulus method for designing of Riser. 5
(b) Calculate the size of a cylindrical riser (height and diameter equal) 5
necessary to feed a steel slab casting 25x25x5 cm with a side riser, casting poured horizontally into the mould by using Modulus method.
4) (a) Define Permeability and its importance 5
(b) Calculate the permeability number of sand if it takes 1 min 25 5
Second to pass 2000 cm³ of air at a pressure of 5g/cm² through standard sample.
5) Explain the working principle of Cupola Furnace with neat sketches. 10
6) Draw Iron Carbon diagram and indicates all the points 10
- *****-----

Blends

200

$$g = 4/4 + 4 \times 2 / 4 + 4$$

$$g = 4/4 + 4 \times 2 / 4$$

$$g = 1 + 1$$

0.05 f 4.0 g

(4-6)

(iii) A load of 270 kN is carried by a short concrete column 250 mm \times 250 mm in size. The column is reinforced with 8 bars of 16 mm diameter. Find the stresses in concrete and steel, if the modulus of elasticity for the steel is 18 times that of concrete. (5+5)

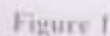
(5+5)

(6-4)

$$E = 2 \times 10^5 \text{ N/mm}^2$$

(5+5)

(10)



$R_1 + R_2 = 600$
 $R_2 \times 6 = 1800 + (200 \times 4) \times 6$
 $4800 + 1800$
 $\frac{6600}{6}$

Safe pt

$1 \text{ m} = 10^{-3} \text{ mm}$