

Shivaji University, Kolhapur
Question Bank For Mar 2022 (Summer) Examination

Subject Code: 71820 Subject Name: B.Tech. CBCS Part 1 Semester 1 - Basic
Mechanical Engineering

Common subject Code (if any) _____

- Q.1 a) 1 State statements of second law of thermodynamics with example.
2 Define thermodynamic state, thermodynamic process and thermodynamic cycle.
3 What is statement of first law of thermodynamics and state its limitations
4 Which are the different thermodynamic systems
5 Define heat and work. State different forms of work.
- b) 1 The working fluid in a steady flow process flows at a rate of 220 kg/min. The fluid rejects 100 kJ/s passing through the system. The condition of the fluid at inlet & at outlet are as given below.
Inlet velocity = 320 m/sec. Inlet pressure = $6 \times 10^5 \text{ N/m}^2$
Inlet internal energy = 2000 kJ/kg Inlet specific volume = $0.36 \text{ m}^3/\text{kg}$
Outlet velocity = 140 m/sec. Outlet pressure = $1.2 \times 10^5 \text{ N/m}^2$
Outlet internal energy = 1400 kJ/kg Outlet specific volume = $1.3 \text{ m}^3/\text{kg}$
Determine the power capacity of a system.
- 2 In a gas turbine power plant the gases flow through the turbine is 15 kg/sec. and the power developed by turbine is 12000 kW. The enthalpies of gases at the inlet and outlet are 1260 kJ/kg and 400 kJ/kg respectively. The velocities of gases at the inlet and outlet are 50 m/sec. and 110 m/sec. Calculate the rate at which the heat is rejected
- 3 12 kg of air per minute is delivered by a centrifugal air compressor. The inlet and outlet conditions of air are $C_1 = 12 \text{ m/s}$, $P_1 = 1 \times 10^5 \text{ N/m}^2$, $V_1 = 0.5 \text{ m}^3/\text{kg}$ and $C_2 = 90 \text{ m/s}$, $P_2 = 8 \times 10^5 \text{ N/m}^2$, $V_2 = 0.14 \text{ m}^3/\text{kg}$. The increase in enthalpy of air passing through the compressor is 150 kJ/kg and heat loss to the surrounding is 700 kJ/min. Find the motor power (W) required to drive the compressor.
- 4 In a steam plant 1 kg of water per second is supplied to the boiler. The enthalpy and velocity water entering the boiler are 800 kJ/kg and 5 m/sec. The water receives 2200 kJ/kg of heat in the boiler at constant pressure. The steam after passing through the turbine comes out with a velocity of 50 m/sec. and its enthalpy is 2520 kJ/kg. The inlet is 4 m above the turbine exit. Calculate the power developed by the turbine consider the boiler and turbine as single system.
- 5 At the inlet of a nozzle the enthalpy of fluid passing is 2800 kJ/kg and velocity is 50 m/sec. At the discharge the enthalpy is 2600 kJ/kg. The nozzle is horizontal. Find the velocity at exit of nozzle

- Q.2 a) 1 Describe the working of four stroke SI engine with neat sketch.
2 Describe the working of four stroke CI engine with neat sketch
3 Compare C. I Engine with S. I Engine
4 Compare two stroke engine with four stroke engine
5 Which are the different components of I. C engine?
- b) 1 Represent Otto cycle on P-V diagram and obtain expression of air standard efficiency
2 Represent Joule cycle on P-V diagram and obtain expression of air standard efficiency
3 Represent Carnot cycle on T-S diagram and obtain expression of air standard efficiency.
4 What is difference between S. I engine and C. I engine?
5 What is difference between two stroke and four stroke engines

- Q.3 a) 1 Explain working of vapour compression refrigeration system
2 Enumerate properties of good refrigerant
3 Classify the refrigerants
4 Explain working of vapour absorption refrigeration system
5 Differentiate between Vapour compression refrigeration and Vapour absorption refrigeration system
- b) 1 Define the following terms
a).Relative Humidity
b) Dry Bulb Temperature
c) Wet Bulb Temperature
d) Dew point temperature
e) Absolute Humidity
2 Explain with neat sketch Window Air Conditioner
3 Define the following terms
a) Dry air
b) Moist air
c) Saturated air
d) Degree of saturation
e) Specific Humidity
4 Define a refrigerant and how they are classified.
5 What is Air conditioning? What is comfort Air condition?

- Q.4 Write short notes.
- i) Application of refrigeration.
 - ii) Psychometric properties of air.
 - iii) Solar refrigeration system.
 - iv) Assumption in air standard cycles.
 - v) PMM-I and PMM-II.
 - vi) Dew point temperature.

vii) System boundary and surrounding.

- Q.5 a) 1 Differentiate renewable and non-renewable energy sources. Enlist Different Applications of Solar energy
2 Draw a layout of hydroelectric power plant and explain its working.
3 Explain flat plate collector and concentric collector with help of neat Sketch.
4 Explain construction and working of Biogas plant.
5 Enlist the renewable energy sources and explain any one of them.
- b) 1 Explain construction and working of Photovoltaic cells.
2 What is wind energy? Explain a typical wind mill with neat sketch
3 What is Biodiesel? State its advantages and limitations.
4 Compare hydroelectric power plant with Steam Power plant.
5 Explain working of steam Power plant
- Q.6 a) 1 Explain with neat sketch construction and working of centrifugal pump. Give its application
2 Explain reciprocating air compressor with Neat Sketch
3 With neat sketch, explain working of Pelton wheel turbine
4 Derive an expression to find the length of belt for open belt drive system
5 Define:
i) Pitch Circle
ii) Addendum Circle
iii) Dedendum
iv) Circular Pitch
- b) 1 Two pulleys are 4.8 m apart. The larger pulley is 2.4 m diameter and smaller pulley is of 1.8 m diameter, the smaller pulley rotates at 180 rpm, the initial tension in the belt is 2.4 kN. Calculate the power transmitted by open belt drive if the coefficient of friction between belt and pulley is 0.3
2 A cross belt connects two pulleys of 500 mm diameter, 2 m apart. The initial tension in the belt is 500 N, if the co-efficient of friction between belt and pulley is 0.3. Find the power transmitted at 700 rpm. Also calculate the length of belt.
3 Two pulleys having diameter 2 m and 1.5 m separated by distance of 5 m, Maximum tension in belt is 3 kN, Coefficient of friction is 0.3. Calculate power transmitted by open belt when smaller pulley rotates at 200 rpm also calculate length of belt. Neglect centrifugal tension.
4 A leather belt transmits 30 kW from a pulley 750 mm in diameter running at 500 rpm. The angle of contact is 160° and coefficient surfaces are 0.3. If the permissible stress in the belt is not to 2 MN/m^2 Determine the belt cross-section area.
5 In flat belt drive the initial tension is 200 N. the coefficient of tension between the belt and pulley is 0.3 and angle of lap on smaller pulley is 150° . Smaller

pulley has diameter of 200 mm and rotates at 500 rpm. Find power in kW transmitted by belt.

- Q.7 a) 1 Explain Metal removing Processes in detail
2 Explain Sand Casting process in detail with neat sketch
3 Define Manufacturing process. Explain Drilling in Detail
4 Explain with neat sketches the turning and knurling operation done on lathe machine.
5 Explain arc welding operation in detail.
- b) 1 Explain basic steps involved in casting process.
2 Explain any two Metal Joining process
3 Differentiate between soldering and brazing. Hence explain brazing.
4 Explain basic steps involved in casting process
5 Explain milling operation with neat sketch.
- Q.8 1 Compare belt, chain and gear drive
2 Write notes on 1. Applications of compressed air. 2. Types of gear.
3 Write note on 1. Gear train. 2. Solar flat plate collector
4 Explain with neat sketch the parabolic collectors.
5 Write note on wind mill.