

**SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY-VASAD**  
**MECHANICAL ENGINEERING DEPARTMENT**  
**EME (2110006) QUESTION BANK**

**Chap -1 Introduction**

1. What is prime mover? Give types of prime movers.
2. Define force and mass and give their fundamental units.
3. Define pressure, Absolute pressure, gauge pressure, and atmospheric pressure.
4. How pressure can be measured?
5. What is flow work? Prove that work can be expressed as a product of pressure and Volume.
6. What is difference between power and energy? Give their SI units.
7. What do you mean by low grade and high grade energy?
8. What is stored energy and energy in transition?
9. List types of mechanical energy.
10. What is heat? Explain.
11. What do you mean by positive and negative heat?
12. Give comparison between work and heat.
13. What is temperature? What is absolute zero temperature?
14. Explain temperature scale.
15. What do you mean by specific heat? Give types of specific heat.
16. What is the significance of mechanical equivalent of heat?

**Chap -2 Energy**

1. What are the sources of energy?
2. Give brief comparison of sources of energy.
3. Explain different sources of energy.
4. What is Fuel?
5. What are main combustible elements of fuel?
6. Give detailed classification of fuel.
7. What are solid fuels? Where they are used?
8. What are the advantages of liquid fuel over solid fuel?
9. List out liquid used with their use.

10. Write a short note on Liquid fuels.
11. State advantages of gaseous fuels over solid and liquid fuels.
12. What is LPG and CNG?
13. Write short note on LPG.
14. Give comparison of LPG and CNG.
15. Write short note on nuclear fuel and their utilization.
16. Explain SUN is the large source of energy.
17. Write a short note on wind energy.
18. Write short note on Bio-Fuels.
19. List the silent features of energy conservation Act 2001.
20. Explain the electricity Act 2003.

### **Chap-3 properties of gases**

1. Why studies of gas laws are necessary?
2. What is the difference between gas and vapour?
3. Derive the expression  $PV/T = \text{constant}$  with the help of Boyle's law and Charle's law?
4. What is the physical significance of gas constant?
5. Prove that  $C_p - C_v = R$  with usual notation.
6. Differentiate isothermal process and adiabatic process.
7. Derive the characteristic gas equation for a perfect gas.
8. State Boyle's law and Charles law.
9. State and explain joule's law of internal energy.
10. What is the difference between flow and non-flow process?
11. Represent the following compilation process on PV diagram with the same initial conditions  
(1) Constant volume (2) constant pressure (3) Isothermal (4) adiabatic
12. Show that change in internal energy  $dU = mC_v(T_2 - T_1)$  for perfect gas.
13. Prove that the value of adiabatic expansion index for a perfect gas is the ratio of its two specific heats.
14. Derived following expression for polytropic process with usual notation.  
(1)  $\delta Q = \gamma - n / \gamma - 1 \times \text{work done}$  (2)  $dU = P_2 V_2 - P_1 V_1 / \gamma - 1$
15. With usual notation show that the polytropic specific heat  $C_n = C_v (\gamma - n / \gamma - 1)$ .
16. Show that change in enthalpy for the process is given by  $dH = mC_p (T_2 - T_1)$ .

17. Prove that the work during isothermal process is given by  $W = P_1 V_1 \ln(V_2/V_1) = P_1 V_1 \ln(P_1/P_2)$ .
18. Derive expression for polytropic index 'n'.
19. Write about combined gas law gas constant and non-flow process.

### **Chap- 4 Properties of steam**

1. Define the following terms with respect to steam (1) saturation temperature (2) latent heat of vaporization (3) quality of steam (4) sensible heat (5) specific volume of steam (6) degree of superheat (7) amount of superheat (8) enthalpy of wet steam (9) enthalpy of dry saturated steam (10) enthalpy of superheated steam (11) latent heat (12) internal energy.
2. Explain the term with reference to water vapour (1) dryness fraction (2) wet steam (3) saturated steam (4) saturated steam (5) superheated steam (6) superheated temperature.
3. Draw the temperature-enthalpy diagram for a constant pressure heating process to represent on it the following (1) sensible heat region (2) latent heat region (3) superheated region (4) dryness fraction 0.7
4. Explain different state of a steam.
5. What is the difference between dry saturated steam and wet steam?
6. Explain what do you understand by the term of quality of steam?
7. Why steam is superheated? Give advantages and disadvantages of superheated steam.
8. What is the difference between dry saturated steam and superheated steam?
9. Explain the formation of steam at constant pressure with suitable sketches.
10. Write an expression for the enthalpy of superheated steam and explain the term used.
11. How do you find out the specific volume of (1) which steam (2) dry steam (3) superheated steam?
12. What do you understand by the term wetness fraction of steam and priming?
13. How internal energy of steam in various conditions can be calculated?
14. What are the information required to tell whether the steam is wet dry saturated or superheated?
15. What do you mean by throttling process?
16. Why steam calorimeters are used?
17. Explain the process of steam formation with the help of a neat graphical representation.
18. Prove that dryness fraction + wetness fraction = 1.
19. Explain working of a throttling calorimeter using neat sketch. Also mention its limitations.

20. What are the limitations of Barrel Calorimeter?
21. With neat sketch explain separating calorimeter.
22. With a neat sketch describe the working of a combined separating and throttling calorimeter.
23. Define: dryness fraction, wetness fraction, specific enthalpy of evaporation, specific enthalpy of superheated steam, specific heat of superheated steam, Wet Steam, Degree of Superheat, saturation temperature.

### **Chap- 5 Heat engine**

1. What is the prime mover? Why they are the most important prime movers?
2. Define heat engine what are the essential requirement of heat engine?
3. What is the difference between heat engine and converting machine?
4. Explain elementary heat engine with neat sketch.
5. State the various sources of heat used for conversion into work.
6. What do you understand by working substance?
7. Differentiate internal combustion engine and external combustion engine.
8. State the assumptions made in air standard cycles?
9. Derive an expression for efficiency of carnot cycle. Discuss why it cannot be used in practice?
10. Derive equation for air standard efficiency of diesel cycle.
11. with usual notation derive the expression for Air standard efficiency of Otto cycle
12. Prove that the efficiency of carnot engine working between the temperature limits  $T_1$  and  $T_2$  is equal to  $(T_1 - T_2) / T_1$ .
13. With usual notation prove that an air standard efficiency of Otto cycle is  $1 - 1/r^{\gamma-1}$ .
14. Show that the efficiency of the Otto cycle is a function of compression ratio only.
15. Derive the thermal efficiency formula for Rankine cycle.
16. For a same compression ratio the air standard diesel cycle is less efficient than air standard Otto cycle explain.
17. Derive an expression for the efficiency of Otto cycle in terms of temperature only.
18. Give limitations of carnot vapour cycle.
19. Efficiency of carnot cycle is independent of working fluid justify.
20. Explain the essential element of heat engines.

## **Chap-6 Steam Boiler**

1. Defined boiler. List the essential parts of a boiler.
2. What is the difference between boiler and steam generator?
3. What is the function of boiler?
4. Give detail classification of boiler.
5. What are the advantages and disadvantages of water tube boiler over the fire tube boiler?
6. What are factors should be considered while selecting a boiler?
  - a. Explain with neat sketches the natural circulation and forced circulation in boiler.
  - b. Differentiate between (i) fire tube and water tube boilers (ii) internally and externally fired boilers.
  - c. Fire tube boilers are not preferred for high pressure steam generation, why?
  - d. State the factor affecting the selection of a boiler.
  - e. Sketch and explain a Cochran boiler.
  - f. Draw the neat sketch of Lancashire boiler and show the path of flue gases.
  - g. Draw a neat sketch of Babcock and wilcox boiler and show the path of the gases in it.
7. Also explain how the water circulation takes place in it.
8. Distinguish between boiler mountings and boiler accessories.
9. Enlist various boilers mountings and accessories. Explain with a neat sketch the working
10. Function of water level indicator.
11. Show the function and location of the following in the boiler plant
  - (i) Economiser (ii) Steam stop valve (iii) Air preheater(iv) Blow off cock
  - (v) Fusible plug (VI) Pressure gauge
12. Explain the working of a spring loaded safety valve.
13. Justify the statement "The economiser used to increase the efficiency of boiler unit".
14. Explain with sketch the superheater in Lancashire boiler.
15. Explain with neat sketch the fusible plug.
16. Explain very briefly the function of following mountings.
  - (i) Safety valve (ii) Water level indicator (iii) Pressure gauge (iv) Feed check valve
  - (v) Steam stop valve (vi) Blow off cock
17. Explain very briefly the function of following boilers accessories.
  - (i) Feed pumps (ii) Injector (iii) Economiser (iv) Steam separator
  - (v) Air preheater (VI) Steam strap.
18. Explain with simple diagram of injector.

## **Chap- 7 Internal Combustions Engines**

1. Define heat engines. How they are classified?
2. Compare I.C. Engines and E.C. Engines.
3. Give classification of I.C. Engines in detail.
4. With neat sketch explain working of four stroke petrol engine. Mention difference between the working of petrol and Diesel engine.
5. Why petrol engines are called as S.I. engines? And why Diesel engines are called C.I. engines?
6. Make comparison between 2-stroke and 4-stroke cycle I.C. engines.
7. Explain with the help of neat sketch, the working of a four stroke petrol engine.
8. Explain brief working of four stroke cycle engines.
9. Explain the following terms as applied to I.C. engines (i) Bore (ii) Stroke (iii) Compression ratio (iv) Piston speed.
10. Explain following terms related to I.C. engines (i) Indicated power (ii) Indicated thermal efficiency (iii) Relative efficiency (iv) Mechanical efficiency.
11. Differentiate between S.I. and C.I. engine.
12. Explain with neat sketch working of 2 stroke petrol engine.
13. Explain following terms of I C engine.
14. Brake power (ii) Indicated power (iii) specific fuel consumption (iv) clearance volume
15. Explain with the help of neat sketches the working of a four stroke diesel engine.
16. State the advantages of two stroke engine over four stroke engines.
17. Why four stroke engines are more fuel efficient?
18. What do you understand by Engine scavenging? Explain.
19. Why deflector is provided on the top of piston in two stroke cycle engines?
20. Justify the use of ports instead of valves in two stroke I.C. Engines.
21. Justify the need of compression of charge to be supplied to two stroke I.C. engines.
22. Give name of device for measurement of brake power.
23. Explain rope brake dynamometer with neat sketch.
24. Give functions of following components used in I C. engines.  
(i) Cylinder (ii) piston (iii) connecting rod (iv) crank (v) Flywheel (vi) crank shaft  
(vii) Carburetor (viii) Fuel injector (ix) spark plug (x) Fuel pump.
25. Differentiate between four stroke and two stroke I.C. engine.
26. Why Diesel engines are called C I engines? Differentiate between S.I and C.I engine.

### **Chap- 8 & 9 Air-Compressor and Pumps**

1. Write the classification of Air compressor. Write the uses of compressed air?
2. Draw the neat sketches of compressor with P – V diagram with and without clearance.
3. Why Multi stage compression is required? Give advantages of multistage compression.
4. Define: Mean effective pressure and volumetric efficiency.
5. Differentiate between reciprocating compressor & centrifugal compressor with respect to principle of working.
6. Classify rotary air compressors. Explain construction and working of centrifugal compressor with neat sketch.
7. Explain with neat sketch construction and working of axial flow air compressor.
8. Define free air delivery (FAD).
9. How pumps are classified?
10. Draw the neat sketches of the following
  - (a) Bucket pump
  - (b) Plunger pump
11. Explain Double acting reciprocating pump with sketch.
12. Explain the function of each part of centrifugal pump with neat sketch.
13. Describe Volute, Vortex and Diffuser type pump with neat sketch.
14. What is priming? Explain. Why priming is required in centrifugal pump but not in reciprocating pumps?
15. List various methods of priming? Explain any one with sketch.
16. Draw the neat sketches and explain vane & gear pump.

### **Chap-10 Refrigeration and Air-Conditioning System**

1. Define the following terms:
  - Air conditioning
  - Refrigeration
  - Coefficient of performance
2. What is refrigeration? What is refrigerating effect? What is one ton refrigeration?
3. Give the classification of air conditioning systems.
4. What is refrigerant? What are the desirable properties of refrigerant? Which are the refrigerants commonly used in practice?
5. With a line sketch describe simple vapour compression system. (Drawing p-h and T-Ø or T-S chart)

6. With a line sketch, describe the vapour absorption refrigeration system.
7. Explain, working and construction of window air-conditioner in detail using neat sketch.
8. What is split air conditioner? State its advantages over window air conditioner.
9. Give comparison between vapour compression and vapour absorption system.
10. Explain bell - Coleman air refrigeration cycle or Air refrigerator with sketch.

### **Chap-11 coupling, clutches and brakes**

1. What is coupling? State its function.
2. Why shaft coupling are used in machinery?
3. Classify the various types of coupling and give example of their applications
4. Why Universal and oldham coupling known as non-aligned coupling?
5. What is the difference between rigid coupling and flexible coupling?
6. How does the making of clamp coupling differ from that of a muff coupling?
7. What are advantages of flexible coupling compared to rigid coupling?
8. What is the difference between protected type and unprotected type flange coupling?
9. Explain the oldham's coupling with neat sketch.
10. Explain with neat sketch the construction and working of bush pin flange coupling.
11. What is clutch? State its function.
12. What are various types of clutches? Distinguish between positive clutch and friction clutch.
13. What are the difference between coupling and clutch?
14. Where positive clutch is used? Explain with neat sketch the working of a jaw clutch.
15. Explain with neat sketch a single plate (disk) friction clutch.
16. Explain with neat sketch the working of cone clutch. What are the advantages of cone clutch compare two disc clutches?
17. Describe with the help of neat sketch the working principle of centrifugal clutch.
18. What is brake? State its function how it is differ from clutch? How are they classified?
19. Describe with the help of neat sketch the working principle of an internal expanding shoe brake.
20. Why does double block brake refer to single block brake?
21. Explain with neat sketch the working of a band brake.
22. Explain about brakes clutches and couplings.
23. Explain with neat sketch the working of a disc brake.
24. Compare and differentiate disc and drum brakes.



## **Chap-12 Transmission of motion and power**

1. What means of drive? Why they are used instead of directly coupling the prime motor machine?
2. Name the methods of drives.
3. Differentiate between individual drive and group drive.
4. Name the different power transmission elements.
5. What are the factor affecting the selection of drives? What are the different types of mechanical drives?
6. Define (1) shaft (2) axle (3) spindle
7. What is the difference between open and crossed system of belt drives?
8. How is the direction of rotation of the driven pulley in built belt drives reversed?
9. Define slip why it occurs?
10. What is creep in belt drives?
11. What are the advantages and disadvantages of belt drives?
12. What are the types of belts?
13. What are the types of belt drives?
14. With neat sketch explain the following terms used in belt drives (1) side and slack side (2) velocity ratio (3) open and cross belt drive.
15. What meaning of initial tension in belt drive?
16. VCA driver is called a positive type of power transmission system?
17. When the following types of gear drives are used? explain with neat sketch (1) spur gear (2) helical gear (3) worm and worm wheel (4) bevel Gear (5) Rack and pinion
18. Define velocity ratio of gear drive.
19. Draw a neat sketch of simple gear train in which both the driving and driven gear wheels to rotate in the same direction.
20. Differentiate simple and compound gear train.
21. Explain with neat sketch working of epicyclic gear train
22. State the different type of pulley used in power transmission.
23. When the fast and loose Pulleys are used? explain
24. Write advantages of chain drive over belt drive.
25. Define velocity ratio for chain drive.
26. What is the function of a jockey Pulley in belt drive?
27. Why friction drive is not used for heavy power transmission?

28. State the application advantages and disadvantages of following drives (1) belt drive (2) chain drive (3) gear drive
29. Write in detail about transmission of motion and power.

### **Chap-13 Important engineering materials**

2. Define ductility elasticity plasticity and weldability.
3. Define the following Mechanical properties (1) strength (2) hardness (3) ductility (4) toughness (5) malleability (6) elasticity (7) creep (8) resilience
4. Define the following technological properties (1) castability (2) machinability (3) workability
5. Give only the name of magnetic and optical properties of Material.
6. Give classification of Engineering Materials.
7. Define ferrous and non-ferrous materials.
8. Differentiate between cast iron and steel.
9. Classify plain Carbon Steel.
10. Give advantages of alloy Steel.
11. What is stainless steel? Give types and advantages.
12. Effects of following alloying elements on steel (1) silicon (2) manganese (3) sulphur (4) Nickel (5) chromium (6) tungsten
13. Define cast iron.
14. Give application of following (1) grey cast iron (2) white cast iron (3) malleable cast iron
15. What do you mean by non-ferrous material? Name any five and state their application.
16. Write the properties and application of following material (1) Timber (2) abrasive material (3) ceramics (4) graphite (5) diamond (6) plastic
17. Enlist physical properties of Engineering Materials.
18. Write short note on composite materials.
19. What do you understand by non-metallic materials? Name any six and state their importance.