



# Question bank of

## Basic Elements of Mechanical Engineering

### (19KBBME24)

## Module 1

### Energy sources

**2 marks**

- Q1: What is the minimum wind velocity required to install a windmill and what is the maximum possibility of conversion of it into electricity.
- Q2: Define solar constant.
- Q3: What is the function control rod in a nuclear power plant?
- Q4: Which type renewable source you suggest for Gulbarga city? Briefly justify.

**4 marks**

- Q1: What are the differences between non-renewable energy source and renewable energy source?
- Q2: Describe the mechanics behind the conversion of wind energy into electrical energy in a windmill
- Q3: list the merits and demerits of wind energy  
List the advantages and disadvantages of solar energy utilization.
- Q4: Enumerate the merits and demerits of conventional and non-conventional energy sources
- Q5: Distinguish between spring and neap tides
- Q6: List the solar and wind power plants in Karnataka

**6 marks**

- Q1: How energy sources are classified?
- Q2: What are the advantages and disadvantages of nuclear energy

**8 marks**

- Q1: With the help of schematic diagram explain working of hydroelectric power plant.
- Q2: Describe how nuclear energy is used to produce electricity in nuclear power plant.
- Q3: Explain the constructional features of a solar flat plate collector and its use in day today life.

- Q4: With the help of schematic diagram show the arrangement of different components of windmill and explain function of each component.
- Q5: Describe the mechanics behind the conversion of wind energy into electrical energy in a windmill
- Q6: Describe how tidal energy can be harnessed to produce electricity
- Q7: With the help of schematic diagram explain the working of power plant using geothermal energy of the earth
- Q8: Suggest the process to harness the Solar energy to supply electricity to the streets lights of Kapnoor village and explain its working principle

**Engineering material**

**2 marks**

- Q1: What is the percentage of carbon in steel and cast iron
- Q2: Define alloy Steels
- Q3: Define composite material

**4 marks**

- Q1: What is the chemical composition of cast iron state its properties and application in industry
- Q2: List the different types of cast iron
- Q3: What are the common elements added to make alloy Steel  
What are the advantages of composite material over conventional material
- Q4: Classify the composite material based on the matrix and reinforcement material used in it
- Q5: Define Nano materials and list its application
- Q6: What are the advantages of polymeric materials
- Q7: Write application of Diamonds in engineering

**6 marks**

- Q1: State the composition properties and application of mild steel
- Q2: State the important properties and application of aluminium
- Q3: List the alloys of copper state their properties and application
- Q4: Differentiate between thermoset and thermoplastic plastics
- Q5: List the application of ceramics in Automotive Aerospace and electronics engineering

## **Module 2**

**Gas laws**

**2 marks**

- Q1: Define the term system and surroundings
- Q2: Define enclosed open and isolated systems

**4 marks**

- Q1: Define a perfect gas what is the difference between perfect and real gas
- Q2: state and explain Boyle's law
- Q3: state and explain Charles law
- Q4: From first principles derive perfect gas equation

**6 marks**

- Q1: Establish relationship between gas constant R and specific heat of gases at constant pressure and constant volume respectively
- Q2: Define 1.Heat 2. Work 3. Internal energy 4. Process 5. cycle 6. state

Q3: The quality of gas at zero degree centigrade occupies 5.6 metre cube What would be its volume at 400 degree centigrade if the pressure is same at both the temperatures.

**8 marks**

Q1: The pressure of gas supplied to engine is is measured as 100 mm of water gauge when barometer reads 756 mm of Mercury determine the the volume of of 1.5 kg of gas if the the temperature is 85 degree centigrade the gas constant is 0.6 86 kilojoules per kg per Kelvin

Q2: Gas at a temperature of 20 degree centigrade and pressure of of 150 e k p a occupies a volume of point 105 metre cube to the gas is compressed the to a pressure of 750 k p a and the volume of 0.04 metre cube what would be the the final temperature of gas

Q3: A gas of certain mass is expanded from an initial state of 400 kph and point 04 metre cube to another condition of 120 e k p a and point 1 metre cube the temperature fall was observed to be 146 degree centigrade if the values of K P and K V R 1.0 216 KJ per kg degree Kelvin and point 7242 kg public kg degree Kelvin. Calculate change in internal energy of the gas

### **Steam and steam boilers AND refrigeration**

**2 marks**

Q1: Define steam

Q2: Define the term quality of the steam

Q3: Define degree of superheat  
Define saturation temperature  
What is boiler

**4 marks**

Q1: Explain the terms wet steam dry saturated steam superheated steam

Q2: What is the function of a boiler

Q3: Compare fire tube boiler with water tube boiler

Q4: Explain the principle of refrigeration

Q5: Name the refrigerant that are commonly used

Q6: What is the difference between split air conditioner window air conditioner

Q7: Why inverter air conditioner is preferred over conventional type.

Q8: Define humidity, Relative humidity, Temperature-humidity index

**6 marks**

Q1: Define enthalpy of steam and write the expression for enthalpy of dry saturated steam enthalpy of wet steam enthalpy of superheated steam

Q2: Write the significance of the steam table and show the different quantities presented in the tabular form

Q3: Define specific volume of steam write the expression for specific volume of wet steam and superheated steam

**8 marks**

Q1: Find the enthalpy of 1 kg of steam at 12 bar when steam is dry saturated steam is 22% wet and superheated to 250°C. Use the steam table assume the Pacific heat of the superheated steam is 2.25 kJ/KgK

Q2: 5 kg of steam of dryness fraction 0.8 passes from a boiler to a superheater at a constant pressure of 1 MPa in the superheater its temperature increases to 350 degree centigrade determine the amount of heat supplied in the superheater the specific heat of superheated steam is 2.25 kJ/kgK

Q3: 1 kg of superheated steam at 1.5 MPa content s 3000 kJ of heat energy find the superheated temperature if 500 kJ of heat energy is removed at the same pressure

what is the condition of the steam

- Q4: Name any five boiler mountings and mention their functions
- Q5: What do you mean by boiler accessories briefly explain function of five accessories
- Q6: The water available in nearby lake is muddy in nature suggest a suitable boiler for the generation of steam and draw the diagram and explain its constructional features and working
- Q7: What are the desirable properties of an ideal refrigerant explain them in brief
- Q8: ABC company would like to produce domestic refrigerator which type of refrigeration system you suggest and explain its working principle with help of neat diagram
- 10 marks**
- Q1: A power plant industry requires 100 kg of superheated steam at 12 bar and having 2500C superheated temperature. A) Which type boiler you suggest and explain its construction, flue path with the help of diagram? B) How many Kilograms of coal is required if the calorific value of coal is 10,000 kj/kg.
- Q2: ABC company would like to produce domestic refrigerator which type of refrigeration system you suggest and explain its working principle with help of neat diagram and mention the state of refrigerant at each stage.
- Q3: Draw the room in air conditioner and label its parts explain its working principle

## Module 3

### Water Turbines

**2 marks**

- Q1: Name the law based on Hydraulic Turbines work?
- Q2: What is hydraulic turbine?
- Q3: Name the hydraulic power plants in Karanataka.

**4 marks**

- Q1: Classify the hydraulic turbine based on principle of working,
- Q2: What are the differences between impulse and reaction water turbine?
- Q3: Compare Francis turbine with Kaplan turbine.
- Q4: Enumerate the advantages and disadvantages of impulse and reaction water turbine?

**6 marks**

- Q1: How hydraulic turbines are classified?
- Q2: Compare between Pelton, Francis and Kaplan turbine.

**8 marks**

- Q1: With a neat sketch explain constructional features and working principle of Pelton wheel.
- Q2: Explain with neat sketch working principle of Francis turbine.
- Q3: With a schematic diagram describe the working Kaplan turbine.

**10 marks**

- Q1: With the help vane arrangement diagram explain working of Francis turbine and List its advantages and disadvantages.
- Q2: With sketch explain the construction of blade and working of Impulse water turbine and List its advantages and disadvantages.

### Steam Turbines

**2 marks**

- Q1: What is steam turbine?
- Q2: List the use of steam turbines

Q3: What are the components of steam turbine assembly

Q4: Name one impulse and reaction steam turbine

**4 marks**

Q1: Enumerate with schematic diagram how propelling force is developed on a steam turbine blade.

Q2: Distinguish between impulse and reaction steam turbines.

Q3: What are the advantages of steam turbines over other prime movers.

Q4: What is compounding of steam turbines?

**6 marks**

Q1: With the help of pressure-velocity diagram explain the working impulse steam turbine.

Q2: With the help of pressure-velocity diagram explain the working reaction steam turbine.

**8 marks**

Q1: Explain velocity compounding, pressure compounding and pressure-velocity compounding

**10 marks**

Q1: With sketch explain the construction and working of a Francis turbine and List its advantages and disadvantages.

Q2: With sketch explain the construction and working of Impulse water and List its advantages and disadvantages.

### **Gas Turbines**

**2 marks**

Q1: List the applications of open cycle and closed cycle gas turbines

Q2: List the classification of gas turbines.

Q3: Which type of compressor is used in a gas turbine plant?

**4 marks**

Q1: What are the differences between open and closed cycle gas turbine?

**6 marks**

Q1: Write brief notes on the operation of open cycle gas turbine with a labeled diagram. Mention advantages and disadvantages

Q2: Write brief notes on the operation of closed cycle gas turbine with a labeled diagram. Mention its advantages and disadvantages.

### **IC Engine**

**2 marks**

Q1: What is an internal combustion engine?

Q2: What is the function of flywheel?

Q3: Define stroke volume and compression ratio.

Q4: What is scavenging?

Q5: What is the purpose of spark plug and fuel injector in IC engines?

Q6: What is friction power?

Q7: Define indicated power, brake power and mechanical efficiency

**4 marks**

Q1: List the difference between SI and CI engine.

Q2: What are differences in Two and four stroke engine?

Q3: With help of a PV diagram explain the working of diesel engine.

Q4: With help of a PV diagram explain the working of Otto engine.

Q5: A single cylinder two stroke cycle IC engine has a piston diameter 105 mm and stroke length 120 mm the mean effective pressure is 6 bar if the crankshaft speed is 1500 rpm calculate the indicated power of the engine

Q6: A four Stroke Petrol engine is running at 2500 RPM the stroke of the piston is 1.5

times the bore, if the mean effective pressure is 0.915 MPa. The diameter of the piston is 140 mm find the indicated power of the engine if the friction power is 13 kW. Find the brake power output and the mechanical efficiency

**6 marks**

- Q1: Write brief notes on the operation of open cycle gas turbine with a labeled diagram. Mention its advantages and disadvantages
- Q2: Write brief notes on the operation of closed cycle gas turbine with a labeled diagram. Mention its advantages and disadvantages.
- Q3: Derive an expression for the indicated power of a four stroke IC engine
- Q4: Which types of IC engines are employed in number 1. Motorcycles number 2. Passenger cars car 3. Trucks what are the approximate values of the brake power in each of the vehicles.
- Q5: A six cylinder 4 stroke IC engine develops 50 KW of indicated power at of 7 bar the bore stroke of the engine cylinder is 70 mm and 100 mm respectively if the engine speed is 37 RPM find the average misfires per minute

**8 marks**

- Q1: Draw the typical IC engine diagram. Label its components and mention the function of each.
- Q2: Classify the IC engine based on cycle of operation and combustion, fuel, position of cylinder, number of cylinder and use
- Q3: A single cylinder four stroke engine runs at 1000 rpm has a bore of 115mm and a stroke of 140mm. The brake load is 6 kgs at 600mm radius and the mechanical efficiency is 80%. Calculate BP and the mean effective pressure.

**10 marks**

- Q1: Draw the position of piston, valves, crank of a four stroke petrol engine and explain the working of all stroke of the engine.
- Q2: Draw the four different diagrams showing the different position of piston and crank of a diesel engine and explain the working of the engine.
- Q3: Explain the working of two stroke petrol engine with help of schematic diagram.
- Q4: A single cylinder 4-stroke IC engine has bore = 180mm, stroke = 200mm, speed = 300 rpm, torque on the brake drum = 200Nm, mean effective pressure = 6 bar. It consumes 4kgs of fuel every hour. The calorific value of fuel = 42000KJ/kg. Determine BP, IP, brake thermal efficiency and mechanical efficiency.
- Q5: A four stroke diesel engine has a piston diameter 250mm and stroke 400mm. The mean effective pressure is 4 bar and the speed is 500 rpm. The diameter of the brake drum is 1000mm and the effective brake load is 400N. Find IP, BP and FP.

Q5: .

**12 marks**

- Q1: Following data was collected from a 4 stroke single cylinder petrol engine at full load. Bore = 200 mm, Stroke = 280mm, speed = 300rpm, indicated mean effective pressure = 5.6 bar, torque on the brake drum = 250Nm, fuel consumed = 4.2 kg/hour, calorific value of fuel = 41000 kJ/kg. Determine mechanical efficiency, indicated thermal efficiency and brake thermal efficiency

- Q2: The following observations were obtained during a trial on a four stroke diesel engine:  
 Cylinder diameter = 25 cm  
 Stroke of the Piston = 40 cm  
 Crankshaft speed = 250 rpm  
 Break load = 70 kg  
 Brake drum diameter = 2 m  
 Mean effective pressure 6 bar  
 Diesel oil consumption = 0.1 m<sup>3</sup>/min  
 Specific gravity of Diesel = 0.78  
 Calorific value of diesel = 43900 kJ/ kg  
 Find 1. Brake power number 2. Indicated power number 3 Frictional power number 4  
 Mechanical efficiency number 5 Brake thermal efficiency number 6 Indicated thermal  
 efficiency

## Module 4

### Joining process 2 marks

- Q1: What is welding process?  
 Q2: What is soldering process?  
 Q3: What is the function of flux in joining process?  
 Q4: List the fluxes used in soldering and brazing process  
 Which welding process you suggest to repair the silencer of automotive?.

**4 marks**

- Q1: How arc is struck in arc welding?  
 Q2: Classify the electrodes used in arc welding  
 Q3: With the help of schematic diagram explain the oxygen hydrogen welding process  
 Q4: List the application of gas welding  
 Q5: Compare soldering and brazing process  
 Q6: What is the difference between soft soldering and hard soldering  
 Q7: State the effects of current and voltage on the quality of weld

**6 marks**

- Q1: With the help of diagram showing explain the arc welding process?  
 Q2: Write a short note on Transformers used in arc welding process  
 Q3: What are the advantages and application of welding  
 Q4: Sketch the different types of welded joints  
 Q5: Describe the different steps of soldering process  
 Q6: What are the advantages of soldering and mention its application  
 Q7: What are the advantages and limitations of brazing  
 Q8: Explain induction brazing and dip brazing  
 Q9: Classify the welding process

**8 marks**

- Q1: List the equipment required for the arc welding process and explain function of each.  
 Q2: Draw equipment required for oxy acetylene gas welding and explain briefly function of each  
 Q3: Sketch the different types of flames used in gas welding and explain their use  
 Q4: With the help of diagram explain leftward and rightward gas welding process

Q5: Classify the soldering methods and briefly explain any two  
**10 marks**

Q1: Compare welding soldering and brazing process  
**12 marks**

Q1:

**machining process**  
**2 marks**

Q1: What is lathe?

Q2: How lathe is specified?

Q3: List the different types of taper turning methods  
**6 marks**

Q1: Draw the line diagram of Central lathe and name its parts

Q2: How Threads are cut on the lathe machine? Explain

Q3: Compare drilling and reaming process

Q4: Explain how boring operation is carried out on drilling machine and mention its use in industry

Q5: Explain spot spacing and tapping operation

Q6: Explain the constructional features of a sensible drilling machine  
**8 marks**

Q1: List parts of a central late and briefly explain function of each

Q2: Explain how knurling operation is carried out on late and its purpose

Q3: Sketch the arrangement of taper turning using compound slide swelling method and explain the procedure.

Q4: With the with the help of sketch explain countersinking and counter boring operation

**Power transmission**  
**2 marks**

Q1: Name the different methods of power transmission

Q2: Why Jockey Pulley is used

Q3: Define slip why it occurs explain

Q4: Define velocity ratio in belt drive

Why gear drive is called a positive type of power transmission  
**4 marks**

Q1: Explain how open and cross belt drives function

Q2: What are the advantages and disadvantages of belt drives

Q3: With neat sketches explain the following terms arc of contact tight and slack sides

Q4: Explain the constructional features of v belt  
**6 marks**

Q1: What are the advantages and disadvantages of gear drives

Q2: Differentiate between simple and compound gear trains  
**8 marks**

Q1: State when the following types of gear drives are employed

1. Spur gears
2. Helical gears
3. Worm and worm wheel
4. Rack and pinion gears
5. elliptical gears

Q2: Derive the expression for the length of belt for the open drive

Q3: In an open belt drive running in the clockwise direction the tension in the tight side is 3000 N and the arc of contact is 150 degree if the coefficient of friction is 0.3 find the tension on the slack side of the belt



- Q4: In a cross belt drive the difference in tensions between the tight and slack sides of the belt is 1000 Newtons find the tensions on the slack and tight sides if the angle of contact is 160 degrees and the coefficient of friction is 0.3
- Q5: The driven Pulley of 400 mm diameter of a belt drive runs at 200 RPM the angle of lap is 165 degrees and the coefficient of friction between the belt material and the pulley is 0.25 find the power transmitted if the initial tension is not to exceed 10 kN

## Module 5

### Automation and Robotics

**2 marks**

- Q1: Define automation  
Q2: Define robotics  
Q3: List the types of automation

**4 marks**

- Q1: List and explain different elements of a robots  
Q2: What are are the advantages and disadvantages of industrial robots  
Q3: Explain advantages and disadvantages of automation systems  
Q4: List the advantages of NC machines over conventional machines  
Q5: What are the salient features of CNC controls  
Q6:  
Q7

**6 marks**

- Q1: Classify the different robots based on configurations  
Q2: List the field of applications of robots explain any two in detail  
Q3: With neat sketch draw automation system showing basic elements and explain it's working
- Q4: Explain the following two types of control system of automation  
1.close the loop control system  
2.open loop control system

- Q5: What are are advantages and disadvantages of CNC machines .

**8 marks**

- Q1: Draw a sketch showing component of component of CNC machine GNE and explain working  
Q2: Draw a sketch showing basic component of numerically controlled (NC) system and explain

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