

**Govt. of Karnataka
Department of Technical Education
Board of Technical Examinations**

Model Question Paper – 1

Course: Concepts of Mechanical Engineering - I

Course Code – 25ME11I

Time: 3 Hrs

Max. Marks: 100

Instructions:

For Part –A Questions, only the first written answers will be considered for Evaluation.

PART- A

I. Select the correct answers from the choices given

15 x 1 = 15

1. What is the unit of force in the SI system?
a) dyne b) newton
c) kilogram d) joule
2. SI unit of moment or torque is _____
a) Nm b) N/m
c) N d) W
3. Steel is an alloy of Iron and _____
a) Manganese b) Copper
c) Tin d) Carbon
4. In grey cast iron, carbon is present in the form of _____
a) Cementite b) Free carbon
c) Flakes d) Spheroids
5. The ability of materials to develop a characteristic behaviour under repeated loading known as-
a) Toughness b) Resilience
c) Hardness d) Fatigue
6. The response of a material due to the function of heat is known as _____
a) Mechanical property b) Electrical property
c) Chemical property d) Thermal property
7. Brass is alloy of Copper and _____.
a) Zinc b) Lead
c) Iron d) Silver
8. Composites can be classified based on _____.
a) matrix type b) Reinforcement constituent
c) matrix type & reinforcement constituent
d) neither on matrix type nor on reinforcement constituent type
9. A piston and cylinder arrangement in an internal combustion engine is an example of which type of kinematic pair?
a) Turning pair b) Sliding pair
c) Rolling pair d) Spherical pair

10. Which of the following is an inversion of a single slider crank chain?
 a) Whitworth quick return mechanism b) Four-bar linkage
 c) Scotch yoke mechanism d) Beam engine
11. In which application is a flat belt drive commonly used?
 a) Gearbox of a car b) Elevator system
 c) Flour mill drive d) Bicycle transmission
12. Rope drives are best suited for which of the following applications?
 a) Compact household appliances b) Connecting gearbox and crankshaft
 c) Elevators and cranes d) Bicycles and motorcycles
13. Which type of gear has teeth parallel to the axis of the gear?
 a) Helical gear b) Bevel gear
 c) Spur gear d) Worm gear
14. A *nut and bolt* combination is an example of:
 a) A welded joint b) A permanent joint
 c) A threaded fastener d) A riveted joint
15. In TIG welding, the electrode used is:
 a) Consumable b) Non-consumable tungsten
 c) Copper rod d) Coated iron rod

II. Fill in the blanks by choosing appropriate answer from those given in the bracket.

(Work piece, Pressure, Pantograph, PVC, Force, Pitch)

5 x 1 = 5

1. Energy and work have the same SI unit because both involve _____ applied over a distance.
2. _____ is a thermoplastic polymer widely used in pipes and cables.
3. The _____ is a four-bar linkage used to copy or scale movements in control devices and plotting instruments.
4. The imaginary circle that rolls without slipping when two gears mesh is called the _____ circle.
5. In arc welding, the electric arc is struck between the electrode and the _____.

PART- B

III. Answer ANY FIVE of the following. Each question carries two marks.

5 x 2 = 10

1. Write the SI Units for the following derived quantities: a) Acceleration b) Energy
2. Define an Alloy.
3. What do you mean by Specific Heat.
4. Define Composites.
5. What is Mechanism.
6. Define "kinematic pair."
7. Define Velocity ratio of a Belt drive
8. What is Brazing.

PART- C

IV. Answer ANY FIVE of the following. Each question carries three marks.

5 x 3 = 15

1. A car travels 90 meters in 6 seconds. Calculate its velocity and Acceleration.
2. List any three properties of High Speed Steel (HSS).
3. Mention the main constituents of Brass with its composition.
4. Explain Thermal Conductivity.
5. List the types of constrained Motions.
6. Define a Machine in the context of Kinematics.
7. Mention the different Materials used for Belts.
8. Write the Principle of Soldering.

PART- D (Section -I)

V. Answer ANY FIVE of the following. Each question carries Five marks.

5 x 5 = 25

1. Calculate the Pressure exerted when the Force of 150N is applied over an area of 0.5m². Express your answers in kPa.
2. Differentiate Thermosetting Plastics and Thermoplastics.
3. Explain any two Mechanical Properties of Materials with examples.
4. Identify the suitable metal used in the production of Gear Housing of an automobile. Mention its properties.
5. Explain 4-bar mechanism.
6. Differentiate between Chain and rope drives.
7. Two gear wheels having 80 teeth and 30 teeth mesh with each other. If the smaller gear wheel runs at 480 rpm, find the speed of the larger wheel.
8. Explain Oxy-Acetylene gas welding process.

PART- D (Section -II)

VI. Answer ANY THREE of the following. Each question carries Five marks.

10 x 3 = 30

1. Which cutting tool material is suitable for machining mild steel at moderate speeds? Justify your choice based on alloying elements and properties.
2. Suggest two non-ferrous materials for a component to resist high temperature and corrosion. Justify based on properties.
3. Discuss any two applications of inversions of slider crank mechanism with suitable sketches.
4. A flour mill uses a motor running at 1440 rpm connected to a shaft through an open belt drive. The diameter of the motor pulley is 200 mm, and the shaft pulley is 500 mm. If the belt drive has a 5% slip, determine: a) The speed of the shaft. b) Is the system suitable for constant load transmission? Justify.
5. A workshop needs to join two mild steel plates permanently. Recommend a suitable welding process and describe the steps involved in performing a fillet lap joint.

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Model Question Paper – 2

Course: Concepts of Mechanical Engineering - I
Time: 3 Hrs

Course Code – 25ME11I
Max. Marks: 100

Instructions:

For Part –A Questions, only the first written answers will be considered for Evaluation.

PART- A

I. Select the correct answers from the choices given

15 x 1 = 15

1. Which system of units is the internationally recognized standard for scientific and technical measurements?
 - a. CGS System
 - b. SI System
 - c. MKS System
 - d. FPS System
2. What is the SI unit for work?
 - a. Watt (W)
 - b. Pascal (Pa)
 - c. Newton (N)
 - d. Joule (J)
3. Which of the following is an electrical property of a material?
 - a. Resistivity.
 - b. Electrical resistance.
 - c. Magnetic permeability.
 - d. Thermal expansion.
4. What is a common property of ceramic materials?
 - a. High thermal conductivity
 - b. Excellent ductility
 - c. High melting points and good chemical stability
 - d. Good electrical conductivity
5. Percentage of Carbon in Low carbon Steel
 - a. 0.05 to 0.3%
 - b. 0.1 to 0.2%
 - c. 0.03 to 0.5 %
 - d. 3 to 5%
6. Which of the following is an example of a thermoplastic polymer?
 - a. Polyurethane
 - b. Epoxy
 - c. Bakelite
 - d. ABS
7. Which of these materials is classified as a ferrous material?
 - a. Copper
 - b. Aluminium
 - c. Titanium
 - d. Steel
8. An alloy is a
 - a. Pure metal
 - b. Mixture of metals in any proportion
 - c. Mixture of metals in fixed proportion
 - d. Mixture of two non-metals
9. Lower pairs in kinematics are characterized by which type of contact between their elements?
 - a. No contact
 - b. Surface contact
 - c. Point contact
 - d. Line contact

15. Which of the following is not a type of nut?

(Corrosion, Fixed, Slider crank, Capillary, gram per cc, Moving) 5 x 1 = 5

- _____action

PART- B

5 x 2 = 10

8. Give any two examples of temporary fasteners.

PART- C

IV. Answer ANY FIVE of the following. Each question carries three marks. 5 x 3 = 15

1. For baking a cake at 356° F, what temperature should you set in your oven in Celsius (°C)? Show the Conversion.
2. Classify Steels based on the percentage of Carbon content.
3. Explain Malleability and Ductility of a material.
4. Mention any three distinct properties of Ceramics.
5. List the types of kinematic links.
6. List the various types of belt drives.
7. Explain Pressure angle with respect to Gears.
8. List any three defects of Welding.

PART- D (Section -I)

V. Answer ANY FIVE of the following. Each question carries Five marks. 5 x 5 = 25

1. A constant Force of 25N moves an object at a distance of 10m. Calculate the work done in Joules (J), Convert it into CGS and FPS units.
2. Explain the classification of Engineering materials.
3. Explain how the composite materials are differing from other materials in engineering applications.
4. Identify the Nickel alloy used in the production of Impellers. Justify the selection based on its properties.
5. Explain the mechanism used in Shaping machine.
6. A pair of spur gears transmits motion between two parallel shafts. If the driving gear has 20 teeth and rotates at 1200 RPM, and the driven gear has 40 teeth, calculate the speed of the driven gear.
7. Differentiate Machine and Structure.
8. Explain Arc welding process.

PART- D (Section -II)

VI. Answer ANY THREE of the following. Each question carries Five marks. 10 x 3 = 30

1. Which two mechanical properties are critical for a cutting tool used on hardened steel at high speeds? Justify your choices.
2. Discuss why brass, is often preferred for plumbing pipes and fittings over pure copper or other metals. Highlight its composition and properties.
3. Discuss the components of a four-bar chain Mechanism and their functions.
4. Identify and briefly explain the type of gear drives used for the following conditions:
a) When the axes of the shafts are parallel b) When the axes of the shafts are Perpendicular
5. Identify the type of fastener used in the assembly of Bus body /Rail coaches and Bridges. Justify why it is preferred over other fasteners.

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Model Question Paper – 3

Course: Concepts of Mechanical Engineering - I

Course Code – 25ME11I

Time: 3 Hrs

Max. Marks: 100

Instructions:

For Part –A Questions, only the first written answers will be considered for Evaluation.

PART- A

I. Select the correct answers from the choices given

15 x 1 = 15

1. Derived units can be expressed in terms of _____.
 - a. Fundamental units
 - b. Arbitrary units
 - c. Base units
 - d. Standard units
2. The fundamental units of SI system are the same as that of
 - a. MKS System
 - b. CGS System
 - c. FPS System
 - d. None of the above
3. The tendency of a deformed solid to regain its actual proportions instantly upon unloading known as _____.
 - a. Perfectly elastic
 - b. Inelastic effect.
 - c. Plasticity
 - d. Delayed elasticity.
4. Medium Carbon steels are tougher than
 - a. High Carbon steel
 - b. Plain carbon steel
 - c. Low carbon steel
 - d. None of the above
5. Gun metal Contains
 - a. 70% copper and 30% zinc
 - b. 90% copper and 10% tin
 - c. 85 to 92% copper rest with tin little with nickel and lead
 - d. 70 – 80 % copper rest with tin
6. The aluminum alloy mainly used for anodized utensil manufacture is
 - a. Y alloy
 - b. Hindalium
 - c. Magnalium
 - d. Duralumin
7. In nodular iron graphite is in the form of?
 - a. Spheroids
 - b. Free carbon
 - c. Flakes
 - d. Cementite
8. Which industry is the largest user of composite materials?
 - a. Transportation
 - b. Marine
 - c. Construction
 - d. Sports
9. A mechanism is an assemblage of
 - a. Two links
 - b. Four or more than four links
 - c. Three links
 - d. All the above

10. Which of these is an inversion of a single slider crank chain?
 - a. Coupling rod of a locomotive
 - b. Beam engine
 - c. Watt's indicator mechanism
 - d. Pendulum pump
11. V-belts are usually used for
 - a. long drives
 - b. short drives
 - c. long and short drives
 - d. none of the mentioned
12. Which type of chain is commonly used for power transmission?
 - a. Leaf chain
 - b. Roller chain
 - c. Silent chain
 - d. Bead chain
13. The main disadvantage of gear drive is:
 - a. Low efficiency
 - b. Slipping of motion
 - c. Inaccurate speed ratio
 - d. Frequent lubrication needed
14. Which joint type is not typically used in brazing?
 - a. Lap Joint
 - b. Threaded Join
 - c. Butt Joint
 - d. Corner joint
15. The color of a neutral oxy-acetylene flame is:
 - a. Blue
 - b. Yellow
 - c. Orange
 - d. White

II. Fill in the blanks by choosing appropriate answer from those given in the bracket.

(Link, Kinematic pair, Volume, stick, Ceramic, Polymers)

5 x 1 = 5

1. The amount of space occupied by an object is its _____.
2. Epoxy, polyester, and vinyl ester are types of _____ used as matrices in composites.
3. A connection between two rigid bodies (links) in a mechanism that imposes constraints on their relative motion is called a _____.
4. In a mechanism, a rigid body or an assembly of rigid bodies that has motion relative to other parts is called a _____.
5. SMAW, commonly known as _____ welding, uses a consumable electrode coated in flux to create the arc and provide shielding.

PART- B

III. Answer ANY FIVE of the following. Each question carries two marks.

5 x 2 = 10

1. Define Temperature.
2. What is cast iron.
3. Define fatigue of a material.
4. What are biodegradable polymers?
5. Define structure in the context of Kinematics.
6. Name any two inversions of the 4 bar chain.
7. Define Dedendum of gear.
8. What is the primary function of an electrode in arc welding?

PART- C

IV. Answer ANY FIVE of the following. Each question carries three marks. 5 x 3 = 15

1. A small metal block has a mass of 400grams and dimensions of 4cm x 3cm x 2cm. Calculate the volume and density of the block. Represent in SI units.
2. What do you mean by 40C8 Steel.
3. Mention the importance of Alloying.
4. Classify composite materials.
5. Define Rigid link and give examples.
6. Write the expression for Speed ratio of Gear train with nomenclature.
7. Mention the effects of slip in belt drives.
8. Mention the fillers used Soldering and Brazing.

PART- D (Section -I)

V. Answer ANY FIVE of the following. Each question carries Five marks. 5 x 5 = 25

1. A machine performs 500 Joules of work in 5 seconds. Calculate the Power output in Watts (W), convert it into CGS and FPS System of units.
2. Explain any one Nickel based alloy.
3. Discuss the Chemical properties of engineering materials.
4. Select the suitable polymer used in the electrical switch board. Mention its properties.
5. Explain the working of Epicyclic Gear train.
6. Discuss the advantages of V-belt drives over flat belt drives.
7. Discuss the type of kinematic pair used in the following applications.
i) Piston and cylinder ii) Nut and Bolt
8. Differentiate between temporary and permanent joining process.

PART- D (Section -II)

VI. Answer ANY THREE of the following. Each question carries Five marks. 10 x 3 = 30

1. Component A faces sudden impact; Component B deforms under static overload. a) What property is crucial and what is not acceptable for A? Justify. b) What property is desirable for B? Justify.
2. Which non -ferrous metals are suitable for making bearings and bushes and making cutting tool inserts. Mention why those are to be chosen based on its properties.
3. Discuss Double slider crank and Scotch Yoke mechanisms with suitable sketches.
4. An engine, running at 150 r.p.m., drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft being 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Find the speed of the dynamo shaft, when 1. there is no slip, and 2. there is a slip of 2% at each drive.
5. Why is brazing suitable for repairing a broken cast iron bracket without melting the base metal? Suggest a suitable filler material and justify.