TED (22) –2021 **REVISION – 2022**

SECOND YEAR KGCE EXAMINATION IN MECHANICAL ENGINEERING

MECHANICAL ENGINEERING-II (TRADE THEORY)

MODEL QUESTION PAPER – ANSWER KEY

(Time : 3 hours) (Maximum Marks: 60)

PART-A

(Maximum Marks: 20x1 Marks = 20 Marks)

I. Answer the following questions by choosing the correct answer from the options given below. Each question carries 1 mark.

Q No	Question	Answer
1	Density of Mild steel is?	a) 7850 kg/m^3
2	The anticipated or probable cost of work and is usually prepared before the construction is known as?	b) Estimated cost
3	The main factor to be considered while preparing a detailed estimate is?	d) All of the above
4	A defect is likely to occur if cast iron is welded without preheating?	c) Crack
5	What is the position of pipe in 1G?	c) Horizontal position
6	While gas cutting, the preheat oxy-acetylene flame should be?	c) Neutral
7	The width of cut produced by oxy-acetylene cutting is called?	a) Kerf
8	In TIG welding, the type of electrode used is?	a) Non consumable
9	The welding process that uses heat from an exothermic reaction to produce coalescence between metals is?	b) Thermit welding
10	A reamer is used to_____?	b) Finish a drilled hole
11	What is the angle of ACME thread?	c) 29°
12	What is the term of the algebraic difference between a size, to its corresponding basic size?	a) Deviation
13	Which instrument is used to measure the effective diameter of the screw threads?	c) Screw thread micrometer
14	What is the extreme permissible size within which the operator is expected to make the component?	d) Limits of size
15	Which scraper is used to scrape the centre portion of large flat surface?	b) Hook scraper
16	Which is known as universal code in CNC programming?	a) G-Code
17	CNC code for defining absolute system is?	b) G 90
18	In shaper, the relative motion of tool and work is?	a) Tool translates over work

Q No	Question	Answer
19	Which one of the following machine tool is preferred for key way cutting?	a) Milling
20	Quick return mechanism is used in which machine tool?	c) Shaper

PART-B

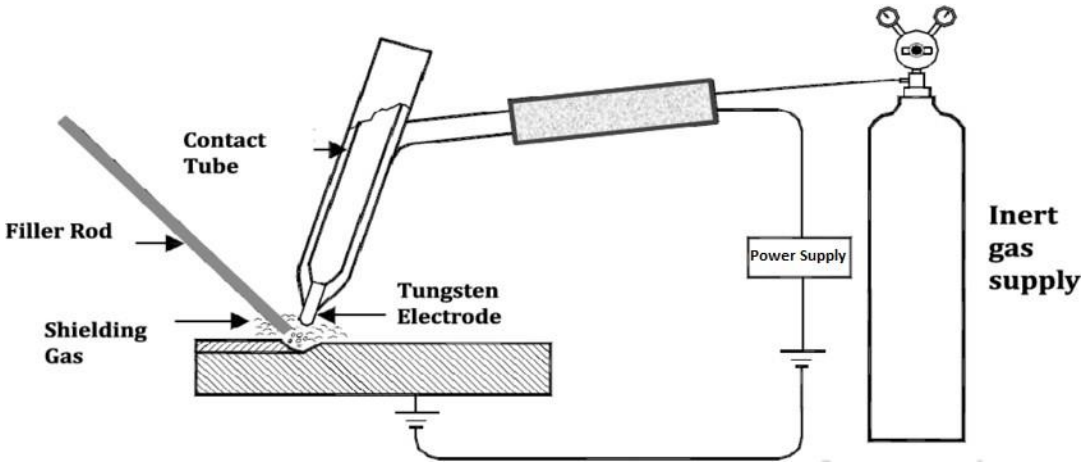
(Maximum Marks: 8x5 Marks = 40 Marks)

II. Answer *any eight* questions from the following. Each question carries marks.5 Marks.

Q No	Question
1	Explain the factors affecting the welding cost? The cost of welding depends on various factors, including: 1. Material cost: The cost of the metal being welded is one of the most significant factors affecting the welding cost. 2. Labor cost: The cost of labor includes the wages of the welders and any support staff, such as inspectors or supervisors 3. Welding process: Different welding processes have different costs associated with them. For example, gas metal arc welding (GMAW) is typically faster and less expensive than tungsten inert gas (TIG) welding, which requires more skill and precision. 4. Welding equipment: The cost of welding equipment can vary greatly depending on the type and quality of the equipment needed for the job. 5. Welding consumables: Welding consumables, such as electrodes or filler materials, can also add to the overall cost of welding. 6. Welding preparation: Proper preparation is essential for successful welding, and the cost of preparation can add to the overall cost of the job. 7. Welding quality requirements: The quality requirements of the job can also affect the welding cost.
2	An open water tank 1 m x 1 m x 2.5 m height is to be fabricated from MS plate of 10 mm thick. Estimate the cost of tank from the following data: Density of MS = 7850 kg/m^3, Cost of MS plate = Rs 90/kg, Cost of fabrication = 25% of material cost, Cost of welding = Rs 0.25 per cm length (Assume missing data if any). 1. Material Cost (MS Plate) Total Area of plate = (1x2.5) x 4 nos + (1x1) m^2 = 11 m^2 Volume = Area x Thickness = 11 x 0.01 = 0.11 m^3 Total weight of MS plate = Volume x Density = 0.11 x 7850 = 863.5 kg Total cost of MS Plate = 863.5 x 90 = **Rs 77,715 /-** 2. Cost of fabrication Fabrication cost = 25% of material cost = .25 x 77715 = **Rs 19428.75 /-** 3. Cost of welding Length of welding = (2.5x4) + (1x4) = 14m = 1400cm Total cost of weld = 1400 x 0.25 = **Rs 350 /-** **Cost of the tank** = 77715 + 19428.75 + 350 = **Rs 97493.75/-** *(Cost of consumables not considered, Assuming single pass weld from outside only)*

Q No	Question
3	What are the factors to be considered for estimation of Machining time in lathe? The following are some of the key factors that must be taken into account when estimating machining time: - Work piece material - Work piece size - Depth of cut - Cutting speed - Feed rate - Tool material and geometry - Machine setup time - Operator skill The machining time in a lathe can be calculated using the following formula: Machining time (T) = L / (f*N) Where, 'L is the length of the workpiece that needs to be machined 'f' is the feed rate (in mm/rev or inches/rev) at which the cutting tool moves along the workpiece 'N' is the spindle speed (in revolutions per minute)
4	List different welding defects? Weld defect is an imperfection in the weld which may lead to failure of the weld joint under the service condition for which is designed. - Poor fusion - Under cut - Over lap - Excessive penetration - Incomplete penetration - Slag inclusions - Incomplete fusion - Unequal leg length - Blow holes - Porosity - Stray arc - Spatters - Cracks
5	What are the different non destructive tests conducted in weld joints? What are the advantages of NDT? Non-destructive testing (NDT) is a group of techniques used to evaluate the integrity of a weld joint without causing any damage to the material being tested. Some of the most common NDT methods used for weld joints include: - Visual Inspection - Liquid Penetrant Testing (LPT) - Magnetic Particle Testing (MPT) - Ultrasonic Testing (UT) - Radiographic Testing (RT) - Eddy Current Testing (ECT)

Q No	Question
	Non-destructive testing (NDT) has several advantages, including: - Improved safety: there is no risk of damaging the material being tested or causing harm to the operator conducting the test. - Efficiency: NDT techniques can provide results quickly, which means that any defects or flaws can be identified and addressed promptly. - Saves time and money: NDT can help detect defects or flaws in materials or components before they cause any serious damage or failure - Wide range of applications: NDT can be used to inspect a wide range of materials and components, including metals, plastics, ceramics, composites, and more. - Environmentally friendly: NDT does not involve the use of chemicals or other hazardous materials. - High accuracy: NDT techniques can provide accurate and reliable results.
6	Explain the mechanism of metal arc cutting? Metal arc cutting (MAC) is a process that uses an electric arc to cut through metal. This is done by melting the metal at the cut by the heat of an electric arc and blowing molten metal by a jet of air. The basic mechanism of metal arc cutting involves three main components: a power source, a consumable electrode, and a workpiece. 1. Power Source: The power source supplies the electrical energy needed to create the arc. The power source generates a high voltage, low amperage electrical arc that is focused on the workpiece to be cut. 2. Consumable Electrode: The consumable electrode is typically made of a metal that has a lower melting point than the workpiece. As the arc is created, the tip of the electrode melts and forms a pool of molten metal on the workpiece. The molten metal is then blown away from the cut by a stream of gas, typically compressed air or oxygen. 3. Workpiece: The workpiece is the metal that is being cut. As the arc is created, the intense heat from the arc melts the metal on the workpiece. The molten metal is blown away from the cut by the gas stream.
7	With a neat sketch, explain TIG welding? TIG welding, also known as Gas Tungsten Arc Welding (GTAW), is a type of welding process that uses a non-consumable tungsten electrode to create an arc that melts and fuses the base metal. In this process, a filler metal may or may not be used depending on the requirements of the joint being welded. The tungsten electrode, welding torch, and filler metal are all used to create a strong, precise weld between two pieces of metal. The shielding gas protects the weld area from atmospheric contamination, and the welding machine provides the power and control needed to complete the welding process. TIG welding produces high quality welds in non ferrous metals practically no weld cleaning is necessary.

Q No	Question
	
8	List various advanced welding techniques used in industry? There are several advanced welding techniques used in industry today. Some of the most commonly used techniques include: - Gas Tungsten Arc Welding (GTAW) or TIG welding - Gas Metal Arc Welding (GMAW) or MIG welding - Flux-Cored Arc Welding (FCAW) - Plasma Arc Welding (PAW) - Electron Beam Welding (EBW) - Laser Beam Welding (LBW) - Friction Stir Welding (FSW) - Ultrasonic Welding - Submerged arc welding - Atomic hydrogen welding
9	Explain limit, fit and tolerance? Limit, fit, and tolerance are three important concepts used in engineering to ensure that two mating parts can be assembled together with the required degree of accuracy and functionality. Limits define the maximum and minimum size of the part, fit determines how well the parts will fit together, and tolerance allows for allowable variation in the size and shape of the parts. <u>Limits:</u> Limits refer to the maximum and minimum sizes of a part or component. They are used to define the acceptable range of dimensions for a part. Limits are usually expressed in the form of upper and lower dimensional values that are used to specify the size of the part or component. <u>Fits:</u> A fit refers to the degree of tightness or looseness between two mating parts. It is the relationship between the hole and the shaft that are intended to fit together. The fit determines how well the two parts will fit together and how easily they can be assembled or disassembled. Types of fit are clearance fit, transition fit, interference fit. <u>Tolerance:</u> Tolerance refers to the allowable variation in the size and shape of a part or component. Tolerance is the difference between the maximum and minimum limits of a dimension. It is a measure of the degree of precision required in the manufacturing process to ensure that the part will fit properly and perform its intended function.

Q No	Question
10	List various screw threads used in an industry? Screw threads having various applications can be classified as follows: 1. <u>Based on location of thread profile</u> - Internal thread (in nuts) - External thread (on bolts) 2. <u>According to configuration</u> - Straight (helical) - Tapered (helical) - Radial (scroll) as in self centering chucks 3. <u>According to direction of helix</u> - Left hand - Right hand 4. <u>According to form or thread profile</u> - ISO Metric thread (60°) - Acme thread (29°) - Square thread (90°) - Buttress thread (45°) - Knuckle thread (30°) - Worm thread (29°) - British Std Whitworth (BSW) (55°) 5. <u>According to number of start</u> - Single start - Multi start 6. <u>According to spacing of threads</u> - TPI (Threads Per Inch) - Pitch (or lead) in mm
11	State the importance of CNC machines in industry? CNC (Computer Numerical Control) machines have become an essential part of modern manufacturing and are widely used in various industries such as automotive, aerospace, medical, and electronics. Here are some reasons why CNC machines are important in industry: 1. Precision: CNC machines offer high precision and accuracy in manufacturing, which is critical in industries where even the slightest error can cause significant problems. 2. Efficiency: CNC machines operate with greater efficiency than traditional machines because they are automated and require minimal human intervention. They can produce complex parts in less time and with less waste, thereby increasing productivity and reducing costs. 3. Flexibility: CNC machines can be programmed to manufacture a wide range of products, making them versatile and adaptable to different manufacturing needs. This flexibility is particularly useful in industries with a high degree of customization. 4. Consistency: CNC machines can produce identical parts with consistent quality, reducing the chances of errors and improving product reliability. 5. Safety: CNC machines are designed to operate safely, reducing the risk of accidents in the workplace. They can also be monitored remotely, reducing the need for workers to be physically present. Overall, CNC machines play a critical role in modern manufacturing, offering high precision, efficiency, flexibility, consistency, and safety. They have revolutionized the way products are manufactured and have become an essential tool for industries to remain competitive in today's global market.

Q No	Question
12	With a neat sketch, show different parts of a vertical milling machine?