		UNIT-II			
10	a)	Differentiate between hot and cold working processes.	L2	CO2	5 M
	b)	Explain the principle of additive manufacturing technology.	L2	CO2	5 M
		OR			
11	a)	Explain the working of Otto cycle with the help of p-v and T-s diagrams.	L2	CO2	6 M
	b)	What are the advantages and disadvantages of electric vehicles?	L1	CO2	4 M
		UNIT-III			
12	a)	With neat line diagram, explain the working principle of a thermal power plant.	L2	CO3	6 M
	b)	What are different types of belt drives?	L1	CO3	4 M
		OR			
13	a)	Explain different types of robotic joints with line diagrams.	L2	CO3	6 M
	b)	Write any four applications of robots in industry.	L1	CO3	4 M

ME

PVP 23

Code: 23ES1201

I B.Tech - II Semester – Regular Examinations - JULY 2024

BASIC CIVIL & MECHANICAL ENGINEERING

(Common for CE, ME, IT, AIML, DS)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts: Part-A and Part-B.
2. Each Part contains:
- 5 short answer questions. Each Question carries 1 Mark and
- 3 essay questions with an internal choice from each unit. Each question carries 10 marks.

3. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Enlist the safety measures in Civil Engineering.	L1	CO1
1.b)	Differences between substructure and super structure.	L2	CO5
1.c)	Define Surveying.	L1	CO2
1.d)	Define hydrology.	L1	CO4
1.e)	Classify types of dams.	L2	CO4

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Write short notes on scope of Civil Engineering.	L2	CO1	5 M
	b)	List types of cement and explain any three of them.	L3	CO5	5 M
		OR			

3	a)	List the disciplines of Civil Engineering and explain Transportation and Structural Engineering.	L2	CO1	5 M
	b)	Explain about pre-fabrication construction techniques.	L3	CO5	5 M
		UNIT-II			
4	a)	With neat sketches explain the principles of surveying.	L2	CO2	5 M
	b)	The following staff readings were observed successfully with level, the instrument having been moved after 3rd, 6th and 8th readings; 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 meters. Enter the above readings in a page of a level book and calculate the RL of points if the first reading was taken with a staff held on bench mark of 300mt.	L4	CO2	5 M
		OR			
5	a)	List and explain the instruments used in surveying.	L2	CO2	5 M
	b)	Explain the characteristics of Contour Mapping.	L3	CO2	5 M
		UNIT-III			
6	a)	Explain the components of airport with neat sketch.	L2	CO3	5 M

	b)	Differentiate between Flexible and Rigid pavement.	L3	CO3	5 M
		OR			
7	a)	Explain the water quality parameters.	L2	CO4	5 M
	b)	Explain the components of dam with neat sketch.	L3	CO4	5 M

PART – B

		BL	CO
1.f)	Give the classification of engineering materials.	L1	CO1
1.g)	Mention any two roles of mechanical engineer in the society.	L1	CO1
1.h)	Define casting process.	L1	CO2
1.i)	What is a power plant?	L1	CO3
1.j)	Mention the configurations of robot.	L1	CO3

			BL	CO	Max. Marks
		UNIT-I			
8	a)	Explain the new technological developments in mechanical engineering in any two sectors.	L2	CO1	6 M
	b)	Write the applications of metals.	L1	CO1	4 M
		OR			
9	a)	What is the role of mechanical engineering in industries?	L1	CO1	4 M
	b)	Write a short note on engineering materials.	L1	CO1	6 M

PVP23

I B.Tech II Semester Regular Examinations, July-2024
Subject: Basic Civil & Mechanical Engineering/23ES1101
Common to CE, ME, IT, CSDS, AIML

Part-B

Scheme of Evaluation

1f) Classification any 3 carries 1 mark

1g) Any 2 roles of Mechanical engineer carries 1x ½ =1 Mark

1h) Definition in single sentence carries 1 Mark

1i) Definition of power plant in single sentence carries 1 Mark

1j) Any 2 Configurations carries 1x ½ = 1 Mark

8a) Any 2 sectors of Mechanical engineering with atleast each 6 valuable points carries 3 x 2 = 6 marks

8b) Applications with atleast 4 valuable advantages carries 4 x 1 = 4 marks

9a) Any 4 roles of mechanical industries carries 4 x 1 = 4 Marks

9b) list of Any 3 Engineering Materials and brief description of each carries 3 x 2 =6 Marks

10a) Differentiation with atleast 5 differences carries 5 Marks

10b) Working Principle and line diagram of 3D Printing carries 3+2 = 5 Marks

11a) PV & TS diagram of Otto cycle with brief description carries 2+2+2 = 6 Marks

11b) Advantages and Disadvantages atleast 4 valuable points carries 2+2 = 4 Marks

12a) Working principle and Line diagram carries 2 + 4 = 6 Marks

12b) 4 types of belt drives with brief description carries 4 x 1 = 4 Marks

13a) 3 types of robotic joints list and brief description carries 3 x 2 = 6 Marks

13b) Any 4 applications of robots in industry carries 4x1=4 Marks

PVP23

I B.Tech II Semester Regular Examinations, July-2024
Subject: Basic Civil & Mechanical Engineering/23ES1101
Common to CE, ME, IT, CSDS, AIML
Part-B

1.f)

Types of Engineering Material
1. Metals

   a. Ferrous
   b. Non- Ferrous

2. Ceramics
3. Composites
4. Smart Materials

1g) **The following are the major roles of Mechanical Engineer in society**:

i) Mechanical Engineer as Designer
ii) Mechanical Engineer as Product Development
iii) Automobile Engineer
iv) Manufacturer

1h) Casting is the process whereby liquid metal, such as gray iron, aluminum, or bronze, is poured into a mold, cooled, and solidified.

1i) A power plant may be defined as a machine or assembly of equipment that generates and delivers a flow of mechanical energy or electrical energy.

1j) There are 4 Configurations of Robots

1. Cartesian Coordinate System (P-P-P)
2. Cylindrical Coordinate System (R-P-P)
3. Spherical Or Polar Coordinate System (R-R-P)
4. Articulated Arm (R-R-R)

8a) The following are the new technological developments in Mechanical Engineering:

1) Automobile Sector
2) Power Generation Sector

The Automobile.

The development and commercialization of the automobile were judged as the profession's most significant achievement in the twentieth century. Two factors responsible for the growth of automotive technology hav processes for mass manufacturing. power, lightweight engines and efficient is credited with designing the combustion engine. After untold effort by engineers, it is today the power source of choice for most automobiles. In addition to engine improvements, competition safety, fuel economy, comfort, and electric vehicles, antilock brakes, run flat tires, air bags, wide spread use of composite materials, computer control of fuel based navigation systems, variable valve timing, and fuel cells. growth of automotive technology have been high-power, lightweight engines and efficient processes for mass manufacturing. German engineer Nicolaus Otto is credited with designing the stroke internal-combustion engine. After untold effort by engineers, it is today the power source of choice for most automobiles. In addition to engine improvements, competition in the automobile market has led to advances in the areas of safety, fuel economy, comfort, and Some of the newer technologies include hybrid gas-electric vehicles, antilock brakes, run flat tires, air bags, wide spread use of composite materials, computer control of fuel based navigation systems, variable valve timing, and fuel cells. first practical four-stroke internal the power source of choice for most automobiles. In addition to engine improvements, competition in the automobile market has led to advances in the areas of emission control Some of the newer technologies include hybrid brakes, run flat tires, air bags, wide spread use of composite materials, computer control of fuel injection systems, satellite-based navigation systems, variable valve timing, and fuel

Power generation.

One aspect of mechanical engineering involves designing machinery that can convert energy from one form to another. Mechanical engineers manipulate the stored chemical energy of such fuels as coal, natural gas, and oil; the kinetic energy of wind producing turbines; the nuclear energy in electrical plants, ships, submarines, and spacecraft; and the potential energy of water reservoirs that feed hydroelectric power plants. Some of the issues that factor into power generation are the cost of the fuel, the cost of constructing the power plant, the potential emissions and environmental impact, around the scale generation of electrical power is a prime example of the need for engineers to technology, social, environmental, and economic considerations. producing turbines; the nuclear energy in electrical plants, ships, submarines, and spacecraft; and the potential energy of water reservoirs that feed hydroelectric power plants. Some of the issues that are the cost of the fuel, the cost of constructing the power plant, the clock reliability, and safety. The large scale generation of electrical power is a prime example of the need for engineers to balance potential emissions and environmental impact, around the-clock reliability, and safety. The large scale generation of electrical power is a prime example of the need for engineers to technology, social, environmental, and economic considerations.

8b)

Ferrous Metals

Ferrous metals are metals that contain iron as their primary constituent. Iron makes up a¬ significant portion of the metal's composition, typically more than 50%. Because of high iron content, these metals are known for their magnetic properties.¬ Ferrous metals are:¬ Strong Durable Can withstand heavy loads making them suitable for various structural and industrial applications.

Non-ferrous Metals

Aluminum: Lightweight and corrosion-resistant, aluminum is used in a wide range of applications, from aircraft construction to beverage cans.

Copper: Known for its excellent electrical conductivity, copper is widely used in electrical wiring, plumbing, and various industrial applications.

Brass: A copper-zinc alloy, brass is known for its attractive appearance and is used in decorative items, musical instruments, and fittings.

Bronze: An alloy of copper and tin (and sometimes other metals), bronze has been used for centuries in sculptures, coins, and bearings.

Lead: Although less commonly used due to health and environmental concerns, lead is still found in certain applications like radiation shielding.

9a)

The role of a mechanical engineer in Industry:

- Power Generation: Mechanical engineers design and develop power-generating machines such as internal combustion engines, gas turbines, and steam and wind turbines etc
- Heating and Cooling Systems: They design and develop heating, ventilation, refrigeration and air conditioning systems for buildings and other structures.
- Transportation: Mechanical engineers are involved in designing and developing transportation systems, including cars, trains, airplanes, steamers and boats.
- Industrial Equipment: They design, develop and maintain industrial equipment such as machine tools, robots, and conveyor systems & belts
- Infrastructure: Mechanical engineers play a key role in the design and maintenance of infrastructure, including buildings, bridges, roads, and transportation systems.

Overall, Mechanical Engineers are involved in designing, building, and maintaining the engines, machines, and structures that make modern life possible and comfortable.They contribute to society by using their skills to improve the safety, security, efficiency, and comfort of the systems and devices that we rely on every day.

9b)

Types of Engineering Material

1. Metals
   a) Ferrous
   b) Non- Ferrous
2. Ceramics
3. Composites
4. Smart Materials

- **Ferrous metals** are metals that contain iron as their primary constituent. Iron makes up a significant portion of the metal's composition, typically more than 50%. Because of high iron content, these metals are known for their magnetic properties.

- **Non-ferrous metals** are metals that do not contain significant amounts of iron in their composition. Unlike ferrous metals, which primarily consist of iron and small amounts of carbon, nonferrous metals are typically more resistant to corrosion, have different mechanical properties and are often used for various specialized applications.

- **Ceramic materials** are a class of inorganic, non-metallic compounds made primarily from elements such as oxygen, nitrogen, carbon and metals. They are known for their unique combination of properties like
  - High-temperature stability
  - Hardness
  - Electrical insulating properties
  - Resistance to wear, corrosion and chemicals

- **Composite materials** often referred to as composites. They are engineered materials made by combining two or more constituent materials with distinct physical and chemical properties to create a material that exhibits improved or tailored characteristics.
- **Smart Materials** known as intelligent or responsive materials. These materials can be altered or controlled in response to external stimuli, such as temperature, pressure, electric or magnetic fields, light or chemical compounds. These materials have the ability to sense changes in their environment and adapt their behavior accordingly.

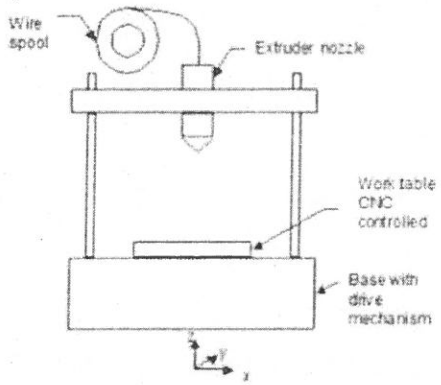
10a)

Differentiate between Hot and Cold Working Processes

S.No	Hot Working	Cold Working
1	Working above recrystallization temperature	Working below recrystallization temperature
2	Formation of new crystals	No crystal formation
3	Surface finish not good	Good surface finish
4	No stress formation	Internal Stress formation
5	No size limit	Limited size

10b)

In additive manufacturing, material is applied layer by layer in precise geometric shapes based on a CAD model. In contrast, conventional manufacturing processes typically involve milling, carving or otherwise removing material to create an object.
The terms 3D printing and additive manufacturing are often used synonymously.
3D printing is the more colloquial term.



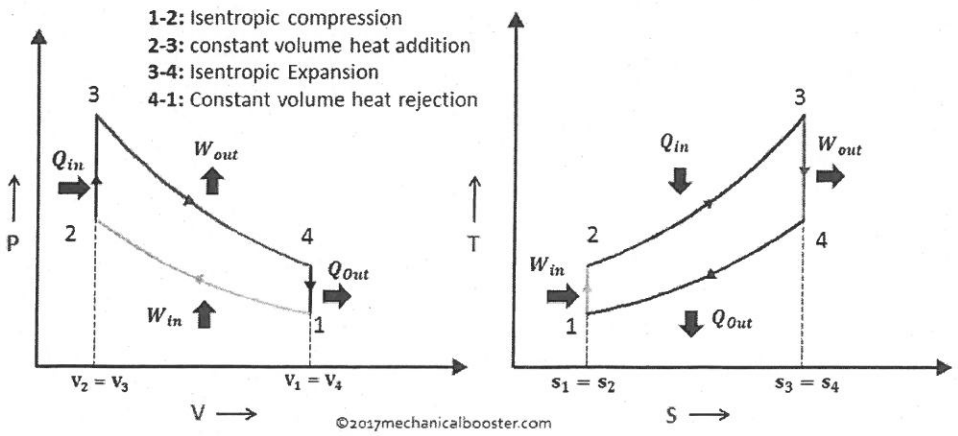
Additive manufacturing refers to the general manufacturing process - the production of objects by adding material - under which various production processes such as rapid prototyping, rapid tooling or mass customization can be subsumed.

Additive manufacturing offers significant benefits to a wide range of industries, whether it's the ability for agile product customization, functional integration, or rapid and cost-effective spare parts procurement.

11a)

Otto Cycle:

1. It is the thermodynamic cycle most commonly found in automobile engines with constant volume combustion.
2. Otto Cycle is petrol cycle which operates on spark ignition.
3. The Otto cycle is a description of what happens to a gas as it is subjected to changes of pressure, temperature, volume, addition of heat and removal of heat.



P-V and T-S Diagram of Otto Cycle

In an ideal Otto cycle, the system executing the cycle undergoes a series of four internally reversible processes: Two reversible adiabatic processes alternated with two isochoric processes.

11b)

Advantages of Electric Vehicles

1. No need for gasoline, eliminating fuel costs
2. .Zero emissions, contributing to environmental sustainability.
3. Cost-effective operation with lower maintenance requirements.
4. Potential for a shorter payback period in some cases.
5. Reduced noise during operation compared to internal combustion engine vehicles.

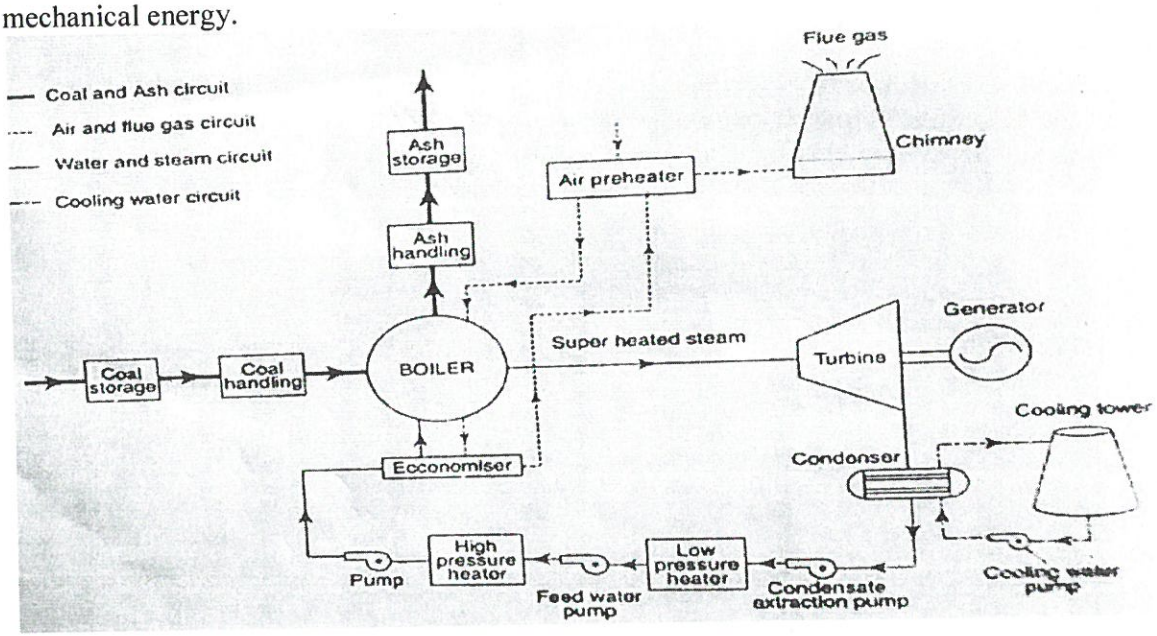
Disadvantages of Electric Vehicles

1. Initial cost, often exceeding that of conventional vehicles.
2. Limited driving range, leading to concerns about range anxiety.
3. Longer recharging times compared to refuelling with gasoline.
4. Insufficient charging infrastructure in some regions.
5. The space and weight of the battery pack can reduce available vehicle space and increase weight, impacting overall vehicle design.

12a)

Working Principle of Steam Power Plant

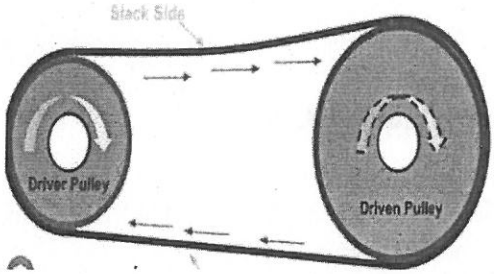
Steam Power Plant is defined as a power station, where electricity is produced using a steam-driven electric generator. The working fluid is water known as feed water and works with steam cycle. Where Steam is produced from the boiler from water and generated steam is used to rotate turbine. Turbine is a device that convert the energy in a stream of fluid into mechanical energy.



In a steam boiler, the water is heated up by burning the fuel in the air in the furnace, and the function of the boiler is to give dry superheated steam at the required temperature. The steam so produced is used in driving the steam Turbines.
This turbine is coupled to synchronous generator (usually three-phase synchronous alternator), which generates electrical energy.
The exhaust steam from the turbine is allowed to condense into the water in steam condenser of turbine, which creates suction at very low pressure and allows the expansion of the steam in the turbine to very low pressure.

12b)

Belt Drives
In case of belts, friction between the belt and pulley is used to transmit power. In practice, there is always some amount of slip between belt and pulleys



Types of Belt Drives:

1. **Flat Belts:** Simple, flat belts made of rubber, leather etc. They're generally used for low applications. They are used to transfer rotational power in industrial equipment and conveyor systems. Flat belts have a low profile with a positive grip, which makes them suitable for high speed drive applications
2. **V-Belts:** These belts have a trapezoidal cross transmission compared to flat belts. They are widely used in industrial machinery and automotive applications
3. **Timing belts:** Also known as toothed belts or synchronous belts, used in machinery and engines where precise motion transfer is crucial. They have teeth that mesh with grooves on the pulleys, enabling accurate power transmission and synchronization between rotating shafts
4. **Round belts:** These belts have circular cross. Round belts are used in motion control. These belts find use in line shafts, industrial conveyors, packaging machinery, photocopiers, printers, etc

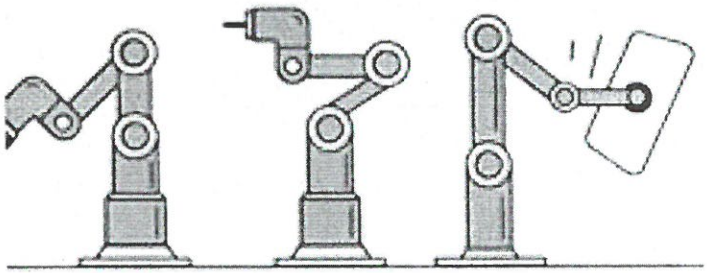
13a)

There are 3 basic ways you can categorize robot joints:

1. Shoulder Joint: The shoulder joint sits at the base of a robotic manipulator. It is often the biggest joint and determines how much the robot can turn around. It has the most significant effect on the size of the robot's workspace.

2. Elbow Joint: The elbow joint sits in the middle of the robotic manipulator. It has the most impact on the robot's lifting strength and sets a large proportion of the robot's range of motion. If the elbow joint is restricted, the robot's workspace will also be restricted.

3. Wrist Joint: The wrist joint sits at the end of the robotic manipulator. It has the most effect on the position of the robot's end effector. Often, wrist joints can spin a full 360 degrees. It is also subjected to more vibrations caused by the environment than other joints.



13b)

Four Applications of Robots in Industries:

1. Material Handling Applications
    i. Material Transfer: Pick and Place Palletizing
    ii. Machine Loading or Unloading
2. Processing Operations
    i. Welding
    ii. Spray Coating
    iii. Cutting and Grinding
3. Assembly and Inspection

Pick and Place Robots

i. Pick and Place, stacking and sorting parts on production line are repetitive and monotonous task. We can automate the tasks using pick and place robots.
ii. Pick and place robots utilize sensors, advanced vision technology and robotic arm to pick an object from one location and drop it at another location.

Palletizing

i. Palletizing is a common industrial process where products or items are stacked onto pallets in a specific arrangement for storage, transportation, or further processing.
ii. Robot palletizing refers to the use of robotic systems to automate this task.

Machine loading and unloading

i. Machine loading and unloading operations utilize a robot to load and unload parts at a production machine.
ii. This requires the robot to be equipped with a gripper that can grasp parts.

Spray painting using robots

i. Robotic spray painting arm is a painting process in which spray painting is done by robots arm to reduce the human load. Robotic spray painting arm has been used for many year in automotive spray painting applications.