14. In the arc welding process, the temperature of the arc can go up to a temperature of
    A) 1000 °C
    B) 3000 °C
    C) 6000 °C
    D) 9000 °C
15. Work – piece is held on
    A) Chuck
    B) Tail Stock
    C) Carriage
    D) Head Stock
16. Lathe center is used for
    A) Cutting
    B) Supporting
    C) Holding
    D) All of these
17. Automation is defined as the technology involved with the use of
    A) Mechanical system
    B) Electronics system
    C) Computer based system
    D) All the mentioned system
18. Which of these are not benefits of automation?
    A) Improved operational efficiency
    B) Decreases the productivity of the system
    C) Repetitive tasks can be completed faster
    D) Improved quality and consistency
19. The integration of mechanical system with the computer is referred as
    A) CAD system
    B) CAM System
    C) CAD/CAM System
    D) Electro mechanical system
20. The most obvious anthropomorphic characteristic of an industrial robot is
    A) Arm of the robot
    B) Drives used in robot
    C) Sensors used in robot
    D) Controller of the robot

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I – 10

			Marks	BT*	CO*	PO*
1.	a)	Describe the process formation of steam with suitable sketches and graphs.	8	2	1	1
	b)	Illustrate the working of Impulse steam turbine (De-Laval turbine) with the help of necessary sketches.	8	2	2	1
2.	a)	Find the specific volume and enthalpy of 1 kg of steam at 10 Bar when (i) the dryness fraction is 0.6 and (ii) the steam is superheated to a temperature of 350°C. The specific heat of superheated steam is 2.25 kJ/kg.K. Given: T_s= 179.9°C, V_f = 0.001127 m³/kg, v_g = 0.194 m³/kg, h_f = 762.6 kJ/kg, h_{fg} = 2013.6 kJ/kg, h_g = 2776.2 kJ/kg.	8	3	1	2
	b)	Describe the working of Francis reaction water turbine with a suitable figure.	8	2	2	1
3.	a)	Classify various sources of energy. Briefly explain these sources of energy.	8	1	1	1
	b)	Explain the working of a centrifugal pump with help of a figure.	8	2	2	1

Unit – II – 19

4.	a)	The following observations were made during a trial on a 2-stroke petrol engine. Cylinder diameter = 20 cm; Stroke of the piston = 30 cm; Crankshaft speed = 400 rpm; Brake load = 80 kg; Brake drum diameter = 1.6 m; Mean effective pressure = 8 bar; Petrol oil consumption = 0.15 m³/min; Specific gravity of petrol = 0.8; Calorific value of petrol = 42,000 kJ/kg; Find: (i) Brake power, (ii) Indicated power, (iii) Mechanical efficiency, (iv) Indicated thermal efficiency.	8	3	3	2
	b)	Explain the method of gas welding with necessary sketches. Also briefly mention steps followed in soldering.	8	2	4	1

			Marks	BT	CO	PO
5.	a)	Describe with a sketch the working of a 2-stroke diesel engine.	8	2	3	1
	b)	The driven pulley of 500 mm diameter of a belt drive runs at 350 rpm. The angle of lap is 160° and the coefficient of friction between the belt material and the pulley is 0.3. Find the power transmitted if the initial tension is not to exceed 15 kN.	8	2	4	2
6.	a)	Describe working of Vapor compression refrigeration system with necessary sketches.	8	2	3	1
	b)	Explain with figures the open & crossed belt drives and simple & compound gear trains.	8	1	4	1

Unit – III

			Marks	BT	CO	PO
7.	a)	Write short notes on the following: i) Open and closed loop mechatronic systems, ii) Fixed automation, iii) Programmable automation, iv) Flexible automation.	8	1	5	1
	b)	Explain the following Lathe operations: i) Facing, ii) Taper Turning, iii) Thread Cutting, iv) Plain turning.	8	1	5	1
8.	a)	Explain the following machining operations with sketches: i) End Milling, ii) Drilling, iii) Surface grinding, iv) Tapping.	8	1	5	1
	b)	Define Robotics. Describe the classifications of robots. Also list applications of robots.	8	1	5	1

BT* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome

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Max. Marks: 100

Duration: 3 Hours

Note:

Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

Part – B: Descriptive Answer type Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I** & **Unit – II** each and **One full** question from **Unit – III**.

<u>PART - A: MULTIPLE CHOICE QUESTIONS</u>   **20 Marks**

1. _____ is not a conventional source of energy.
   A) Coal
   B) Petrol
   C) Flowing water
   D) Solar

2. _____ is a fire tube boiler.
   A) Lancashire boiler
   B) Babcock and Wilcox boiler
   C) Stirling boiler
   D) Yarrow boiler

3. The amount of heat required to raise the temperature of 1kg of water from 0°C to the saturation temperature T_s°C at a given constant pressure is defined as
   A) Enthalpy of liquid
   B) Latent heat
   C) Enthalpy of evaporation
   D) None of these

4. The boiling point of water _____ with the increase of pressure.
   A) Decreases
   B) Increases
   C) Remains same
   D) None of these

5. Prime mover in which the heat energy of the steam is transformed into mechanical energy.
   A) Steam turbine
   B) IC engine
   C) Gas turbine
   D) Water turbine

6. The output of the nozzle is
   A) Low pressure and high velocity steam
   B) Low pressure and low velocity steam
   C) high pressure and high velocity steam
   D) Low pressure and high velocity steam

7. The difference between saturation temperature and superheated temperature
   A) Enthalpy of liquid
   B) Latent heat
   C) Enthalpy of evaporation
   D) Degree of superheat

8. Indicated power of a 4-stroke engine is equal to
   A) $4pLAN$
   B) $pLAN/2$
   C) $pLAN$
   D) $2pLAN$

9. Which of the following does not relate to spark ignition engine?
   A) Spark plug
   B) Carburetor
   C) Fuel injector
   D) Ignition coil

10. The drive used for two shafts which are to be rotated in opposite direction is
    A) Open belt drive
    B) Cross belt drive
    C) Stepped pulley
    D) Chain drive

11. Chain drives with respect to belt drives give
    A) More slip
    B) Less slip
    C) Equal slip
    D) No slip

12. Heat is absorbed by refrigerant during a refrigeration cycle in a
    A) Compressor
    B) Condenser
    C) Evaporator
    D) Expansion valve

13. One tonne of refrigeration is
    A) 210 kJ/min
    B) 210 kJ/hour
    C) 210 kJ/s
    D) 210 MJ/min

Unit – III

7. a) What are the needs to go for automation in industries?
        Briefly explain the characteristics of Fixed, Programmable and
        Flexible automation systems.   10   L2   5
    b) Explain the working principle of a Lathe machine.
        Explain the following machining operations.
            i)   Plain Turning
            ii) Facing   10   L2   5

8. a) What is the principle of working of a milling machine?
        Explain Up milling and Down milling.   10   L2   5
    b) Briefly explain the basic elements of a CNC machine with a simple
        block diagram.   06   L1   5
    c) Define robotics. What are the applications of robotics?   04   L2   5

BT* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE.
(An Autonomous Institution affiliated to VTU, Belagavi)
First Semester B.E. (Credit System) Degree Examinations
April - May 2022
21ME106 – ELEMENTS OF MECHANICAL ENGINEERING

ation: 3 Hours   Max. Marks: 100

Note: *Answer Five full questions choosing Two full questions from Unit – I & Unit – II each and One full question from Unit – III.*

		Marks	BT*	CO*	PO*
	Unit – I				
a)	What is Global warming? What are the impacts of Global warming and climate change?	06	L*1	1	1
b)	What is disaster management? What are the types of disaster management?	04	L1	1	1
c)	What is a centrifugal pump? Explain the working principle and functioning of a centrifugal pump.	10	L2	2	1
a)	What is enthalpy of steam? What is the unit of enthalpy? Find the specific volume and enthalpy of 1kg of steam at 0.8MPa: i) When the dryness fraction is 0.9 ii) When the steam is superheated to a temperature of 300°C. The specific heat of superheated steam is 2.25kJ/kg°K. From steam tables at 0.8MPa, T_s=170.4°C, h_f=720.94kJ/kg, h_{fg}=2046.5kJ/kg, h_g=2767.5kJ/kg, v_g=0.2403m³/kg, v_f=0.001115m³/kg	10 10	L1 L2	1 2	2 1
b)	Explain the constructional features and working of a fire tube boiler.	10	L2	1	1
a)	Explain the process of steam formation at constant pressure condition. Classify the steam based on their characteristics.				
b)	Give the detailed classification of hydraulic turbines. With neat diagram explain the functioning of an Impulse (De Laval) Steam turbine.	10	L2	2	1
	Unit – II				
a)	A 4 cylinder, 2 stroke petrol engine develops 30,000 W at 2,500 r.p.m. The mean effective pressure is 8bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder, if stroke to bore ratio is 1.5. Also calculate the frictional loss and fuel consumption, if the brake thermal efficiency is 28%. The calorific value of the fuel is 43,900 kJ/kg.	10	L3	3	2
b)	What is a mechanical power transmission system? What are the types of mechanical power transmission? Mention a few applications of respective drive types.	10 05	L1 L2	4 3	1 1
a)	Explain any five desirable properties of a good refrigerant.	05	L2	3	1
b)	Compare vapor compression and vapor absorption refrigeration systems.	10	L2	4	1
c)	What is gas welding process? Explain different flame patterns obtained during Oxy-Acetylene gas welding process.	10	L2	3	1
a)	With a neat sketch explain the principle and working of a 4 stroke spark ignition engine.				
b)	A shaft running at 100 rpm is to drive a parallel shaft at 150 rpm. The pulley on the driving shaft is 35cm in diameter. Find the diameter of the driven pulley. Calculate the linear velocity of the belt and also the velocity ratio.	06 04	L3 L2	4 4	2 1
c)	What are composites? Briefly explain its main constituents.				

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NMAM INSTITUTE OF TECHNOLOGY, NITTE
(An Autonomous Institution affiliated to VTU, Belagavi)
First / Second Semester B.E. (Credit System) Degree Examinations
September - October 2022
21ME106 – ELEMENTS OF MECHANICAL ENGINEERING

Duration: 3 Hours   Max. Marks: 100

*Note: Answer **Five full** questions choosing **Two full** questions from Unit – I & Unit – II each and **One full** question from Unit – III.*

			Marks	BT*	CO*	PO*
Unit – I						
1.	a)	Classify and briefly explain the sources of energy.	6	L*1	1	1
	b)	With a neat sketch explain the working of Cochran boiler.	10	L2	2	1
	c)	Differentiate between reaction and impulse turbine.	4	L1	1	1
2.	a)	With a neat sketch explain the formation of steam.	6	L1	1	1
	b)	Explain the working of gas turbine.	4	L2	2	1
	c)	Sketch and explain the working of Babcock and Wilcox boiler.	10	L2	2	1
3.	a)	Give the classification of water turbines. Explain the working of any one in detail.	10	L2	2	1
	b)	List the comparison between impulse and reaction turbines.	6	L2	1	1
	c)	Write short notes on global warming and ozone depletion.	4	L1	1	1
Unit – II						
4.	a)	Sketch and explain the working of a 4-stroke diesel engine.	8	L2	3	1
	b)	How are composite materials classified? Explain briefly.	6	L1	4	1
	c)	Derive expression for length of belt for an open belt drive.	6	L1	4	1
5.	a)	A single cylinder 2-stroke petrol engine has brake torque 640 N-m, cylinder diameter 0.21m, speed 350 rpm, stroke 0.28m, mean effective pressure 5.6 bar, oil consumption 8.16 kg/h, C_v = 42705 kJ/kg. Determine i) Mechanical efficiency ii) indicated thermal efficiency iii) brake thermal efficiency and iv) brake specific fuel consumption.	8	L2	3	1
	b)	Sketch and explain the principle of gas welding.	6	L1	4	1
	c)	Explain the properties of refrigerants.	6	L1	3	1
6.	a)	Sketch and explain the working of vapor compression refrigeration system.	10	L2	3	1
	b)	How are gears classified? Explain.	5	L1	4	1
	c)	Explain the mechanical properties of engineering materials.	5	L1	4	1
Unit – III						
7.	a)	Sketch and explain the various operations performed on a lathe.	8	L2	5	1
	b)	Explain fixed, programmable and flexible automation.	6	L1	5	1
	c)	Sketch and explain the classification of robots, based on its configuration.	6	L2	5	1
8.	a)	Explain the basic elements of CNC machine with a simple block diagram.	8	L2	5	1
	b)	Explain the types of machine tools. Also give their applications.	6	L1	5	1
	c)	Sketch and explain the anatomy of robot.	6	L2	5	1

BT* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome

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