

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2023

Course: B. Tech.

Branch: Mechanical Engg.

Semester: VII

Subject Code & Name: BTMEC702 CAD/CAM

Max Marks: 60

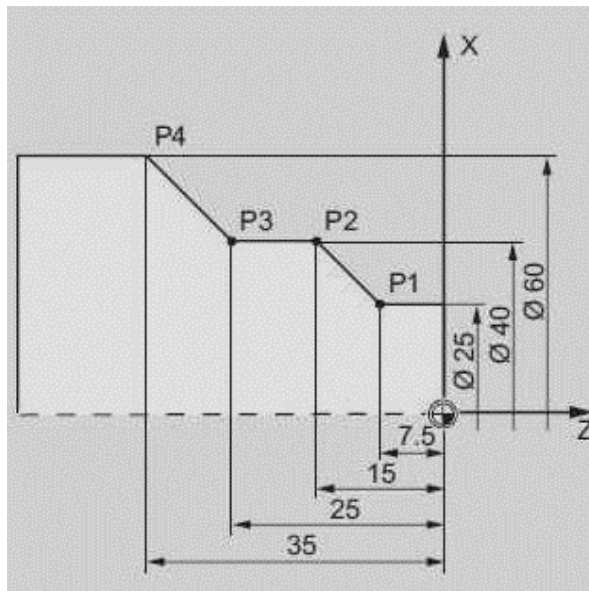
Date: 15/07/2023

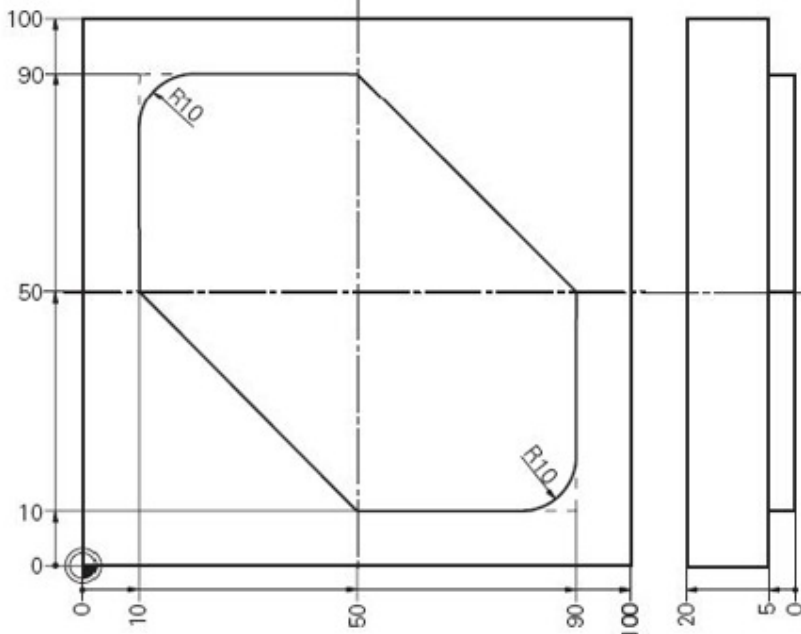
Duration: 3 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

		(Level/CO)	Marks
Q. 1	Solve Any Two of the following.		12
A)	Explain different types of plotters used in CAD applications. Also explain the relative advantages and limitations of each.	CO-01	6
B)	Explain various ground rules for a graphics software?	CO-02	6
C)	Describe any three methods for defining arc of a circle in a graphics software.	CO-01	6
Q.2	Solve Any Two of the following.		12
A)	Compare the wireframe, surface and solid modeling as the modeling techniques for CAD.	CO-03	6
B)	Explain the need of synthetic curves in the CAD applications.	CO-03	6
C)	Wat is FMS? Explain various components of a typical FMS system. Explain the advantages of FMS in manufacturing advantages.	CO-07	6
Q. 3	Solve Any Two of the following.		12
A)	Differentiate between NC, CNC and DNC systems?	CO-05	6
B)	Write NC program for finishing operation of turning of the job as shown in following figure.	CO-05	6



C)	<p>Write NC program for finishing operation of milling of outer surface of the job as shown in following figure.</p>  <p style="text-align: center;">All the dimensions are in mm</p>	CO-05	6
Q.4	Solve Any Two of the following.		12
A)	Explain the steps involved in solving a problem using Finite Element Analysis.	CO-06	6
B)	Explain various properties of stiffness matrix	CO-06	6
C)	Explain the elements used in structural analysis using FEM. (at least one element each from 1D, 2D and 3D)	CO-06	6
Q.5	Solve Any Two of the following.		12
A)	Explain the advantages of GT layout in manufacturing industry.	CO-07	6
B)	Explain the concept of “composite Part” in GT using a suitable example.	CO-08	6
C)	Compare generative and retrieval type of CAPP systems.	CO-08	6
	*** End ***		

<p align="center">DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</p> <p align="center">Supplementary Semester Examination –Summer 2023</p> <p>Course: B. Tech. Branch: Mechanical Engineering Semester: VII</p> <p>Subject Code & Name: Fluid Machinery (BTMEC704A)</p> <p>Max Marks : 60 Date : 26/07/2023 Duration : 3.00 Hrs.</p>			
<p>Instructions to the Students:</p> <ol style="list-style-type: none"> 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly. 			
		(Level/CO)	Marks
Q. 1	Solve Any Two of the following.		
A)	A jet of water having a velocity of 45 m/s impinges without shock a series of vanes moving at 15 m/s, the direction of motion of the vanes being inclined at 20° to that of the jet. The relative velocity at outlet is 0.9 of that at inlet, and the absolute velocity of the water at exit is to be normal to motion of the vanes. Find: (a) vane angles at entrance and exit; (b) work done on vanes per unit weight of water supplied by the jet; and (c) the hydraulic efficiency.		06
B)	A jet of water having a velocity of 36 m/s strikes a series of radial curved vanes mounted on a wheel, which is rotating at 240 r.p.m. The jet makes an angle of 20° with the tangent to the wheel at inlet and leaves the wheel with a velocity of 6 m/s at an angle of 130° to the tangent to the wheel at outlet. Water is flowing from outward in a radial direction. The outer and inner radii of the wheel are 500 mm and 250 mm respectively. Determine: (i) Vane angles at inlet and outlet, (ii) Work done per second per N of water, and (iii) Efficiency of the wheel.		06
C)	Prove that for a curved radial vane the efficiency is given by $\eta = \frac{2(V_{w1} u_1 \pm V_{w2} u_2)}{V_1^2}$		06
Q.2	Solve Any Two of the following.		
A)	Derive the expression for work done and efficiency of Francis turbine.		06
B)	The following data relate to a Pelton wheel : Head: 72m Speed of the wheel: 240 r.p.m. Shaft power of the wheel: 115 kW Speed ratio: 0.45 Co-efficient of velocity: 0.98 Overall efficiency : 85% Design the Pelton wheel.		06

C)	A reaction turbine works at 450 r.p.m. under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is 0.4 m ² . The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine: (i) The volume flow rate, (ii) The power developed, and (iii) The hydraulic efficiency.		06
Q. 3	Solve Any Two of the following.		
A)	In a hydroelectric station, water is available at the rate of 175 m ³ /s under a head of 18 m. The turbines run at a speed of 150 r.p.m. with overall efficiency of 82%. Find the number of turbines required, if they have the maximum specific speed of 460.		06
B)	A turbine is to operate under a head of 25 m at 200 r.p.m. The discharge is 9 m ³ /s. If the efficiency is 90%, determine the performance of the turbine under a head of 20 m.		06
C)	A hydro-turbine is required to give 25 MW at 50 m head and 90 r.p.m. runner speed. The laboratory facilities available permit testing of 20 kW model at 5 m head. What should be the model runner speed and model to prototype scale ratio?		06
Q.4	Solve Any Two of the following.		
A)	A centrifugal pump is to discharge 0.118 m ³ /s at a speed of 1450 r.p.m against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75 percent. Determine the vane angle at the outer periphery of the impeller.		06
B)	Derive the expression for minimum speed for starting the centrifugal pump.		06
C)	A three stage centrifugal pump has impellers 400 mm in diameter and 20 mm wide at outlet. The vanes are curved back at the outlet at 45° and reduce the circumferential area by 10 percent. The manometric efficiency is 90 percent and the overall efficiency is 80 percent. The pump is running at 1000 r.p.m. and delivering 0.05 m ³ /s. Determine: (i) Head generated by the pump, and (ii) Shaft power required to run the pump.		06
Q. 5	Solve Any Two of the following.		
A)	Explain the working of chemical and nuclear pumps with neat schematic diagram with all components details.		06
B)	Explain the Gear pump, Vane pump, and Lobe pump with neat schematic diagram.		06
C)	Explain the reciprocating pump's working with neat schematic diagram.		06
*** End ***			

Course: B. Tech Branch : Mechanical Engineering Semester : VII

Subject Code & Name: BTMEC704C : Finite Element Method

Max Marks: 60

Date: 26/07/2023

Duration: 3 Hr.

Instructions to the Students:

1. Solve five questions of the following.
2. Use of non-programmable scientific calculators is allowed.
3. Assume suitable data wherever necessary and mention it clearly.

	Marks
Q.1 Solve any two of the following.	12
A) Explain Finite Element Terminology.	6
B) Explain the difference between P and h refinement in FEM.	6
C) What are the advantages and disadvantages of FEM.	6
Q.2 Solve any two of the following.	12
A) Write short note on stress equilibrium equation & strain displacement equation.	6
B) Explain the term plane stress and plane strain.	6
C) Explain 2-D state of stress and strains.	6
Q.3 Solve any two of the following.	12
A) What are eigen values and eigen vectors.	6
B) Solve the given set of equations by using Gauss elimination method $x + y + z = 4, 4x + 4y + 3z = 8, 8x + 6y + 2z = 6$	6
C) Explain Gauss elimination method.	6
Q.4 Solve any two of the following.	12
A) Give the different types of 1D element.	6
B) Write short notes on Shape function and its properties.	6
C) Describe formulation of element stiffness matrix and load vector for bar.	6
Q.5 Solve any two of the following.	12
A) Give the different types of 2D element.	6
B) Explain different terms of Isoparametric.	6
C) Explain plane trusses.	6

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2023

Course: B. Tech.

Branch: Mechanical

Semester: VII

Subject Code & Name: Refrigeration and Air Conditioning (BTMEC704E)

Max Marks: 60

Date: 26-07-2023

Duration: 10:00 a.m to 1:00 p.m

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.
5. Use of steam tables, Refrigerant property tables, and Psychrometric charts is allowed

		(Level/CO)	Marks																								
Q. 1	Solve Any Two of the following.		12																								
A)	What is a unit of refrigeration? Prove that 1TR = 3.50 kW	Understand/ CO1	6																								
B)	Explain the selection of refrigerant and Azeotropes refrigerants	Understand/ CO1	6																								
C)	A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35 °C and the lower temperature is -15°C. The capacity is to be 12 tones. Determine i.COP, ii. Heat rejected from the system per hour	Apply /CO1	6																								
Q.2	Solve Any Two of the following.		12																								
A)	Explain the effect of evaporator and condenser temperature on vapour compression cycle performance	Understand/ CO2	6																								
B)	A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of -10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find the C.O.P. of the refrigerator. The relevant properties of methyl chloride are as follows <table border="1" data-bbox="226 1848 1117 1982" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">saturation tempurate in °C</th> <th colspan="2">Enthalpy in kJ/kg</th> <th colspan="2">Entropy in kJ/kg K</th> </tr> <tr> <th>Vapour</th> <th>Liquid</th> <th>Vapour</th> <th>Liquid</th> </tr> </thead> <tbody> <tr> <td>-10°C</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>45</td> <td>460.7</td> <td>45.4</td> <td>0.183</td> <td>1.637</td> </tr> <tr> <td></td> <td>483.6</td> <td>133.0</td> <td>0.485</td> <td>1.587</td> </tr> </tbody> </table>	saturation tempurate in °C	Enthalpy in kJ/kg		Entropy in kJ/kg K		Vapour	Liquid	Vapour	Liquid	-10°C					45	460.7	45.4	0.183	1.637		483.6	133.0	0.485	1.587	Apply /CO2	6
saturation tempurate in °C	Enthalpy in kJ/kg		Entropy in kJ/kg K																								
	Vapour	Liquid	Vapour	Liquid																							
-10°C																											
45	460.7	45.4	0.183	1.637																							
	483.6	133.0	0.485	1.587																							
C)	How does an actual vapour compression cycle differ from that of a theoretical cycle?	Remember/ CO5	6																								

Q. 3	Solve Any Two of the following.		12
A)	Draw a schematic diagram of a cascade system of refrigeration and explain with the help of a p-h diagram	Understand/ CO3	6
B)	Explain the simple aqua-ammonia vapour absorption system,	Understand/ CO3	6
C)	Explain the comparison between vapour absorption & vapour compression systems	Understand/ CO4	6
Q.4	Solve Any Two of the following.		12
A)	The humidity ratio of atmospheric air at 28°C dry bulb temperature and 760 mm of mercury is 0.016 kg / kg of dry air. Determine 1. partial pressure of Water vapour; 2. relative humidity; 3. dew point temperature; 4. specific enthalpy; and 5. vapour density.	Apply /CO4	6
B)	Define human comfort and explain the comfort chart	Remember/ CO5	6
C)	Derive the relationship between relative humidity (ϕ) and degree of saturation (μ)	Understand/ CO5	6
Q. 5	Solve Any Two of the following.		12
A)	Explain the following terms and represent them on the psychometric chart ESHF, GSHF, RSHF	Apply /CO4	6
B)	In a cooling application, moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35° C and 50% RH. The apparatus dew point of the coil is 5° C and the by-pass factor is 0.15. Determine the outlet state of moist air and cooling capacity of the coil in TR	Apply /CO5	6
C)	Explain with a neat sketch window air-conditioner system	Understand/ CO5	6
	*** End ***		

The grid and the borders of the table will be hidden before final printing.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Semester Examination – Summer 2022

Course: B. Tech. Branch : Mechanical Engineering Semester :VII

Subject Code & Name: BTMEC701 & Mechatronics

Max Marks: 60

Date:13/08/2022

Duration: 3.45 Hrs.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

Q. 1 Solve Any Two of the following

- A) What are the elements of a closed loop control system? (CO1) (6)
- B) What are the various static and dynamic characteristics of a sensor? (CO1) (6)
- C) How a tactile sensor works? (CO5) (6)

Q.2 Solve Any Two of the following

- A) How a differential amplifier works? (CO3) (6)
- B) What is the specialty of a successive approximations Analog to Digital Converter (ADC)? (CO2) (6)
- C) How a Digital to Analog Converter (DAC) works? (CO2) (6)

Q. 3 Solve Any Two of the following

- A) Analyse the controlling action of a double-acting cylinder? (CO6) (6)
- B) How the valve bodies are classified? (CO1) (6)
- C) What are the applications of single acting cylinder? (CO1) (6)

Q.4 Solve Any Two of the following

- A) Explain the microcontroller with a block diagram? (CO2) (6)
- B) What are the various types of registers and their functions in 8085 microprocessor? (CO5) (6)
- C) What do you mean by Ladder Logic? Design a Ladder Logic for a simple task of your choice? (CO4) (6)

Q. 5 Solve Any Two of the following.

- A) What do you mean by transfer function? Why derivative controller mode cannot be used alone? (CO6) (6)
- B) Explain the response of a first order system to a step-input? (CO5) (6)
- C) What is the specialty of a PID controller? Design a PID controller for temperature control. (CO6) (6)

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter Examination – 2022

Course: B. Tech. Branch: Mechanical Engg./Mechanical Engg. (Sandwich) Semester: VII

Subject Code & Name: BTMEC701 Mechatronics

Max Marks: 60

Duration: 3 Hr.

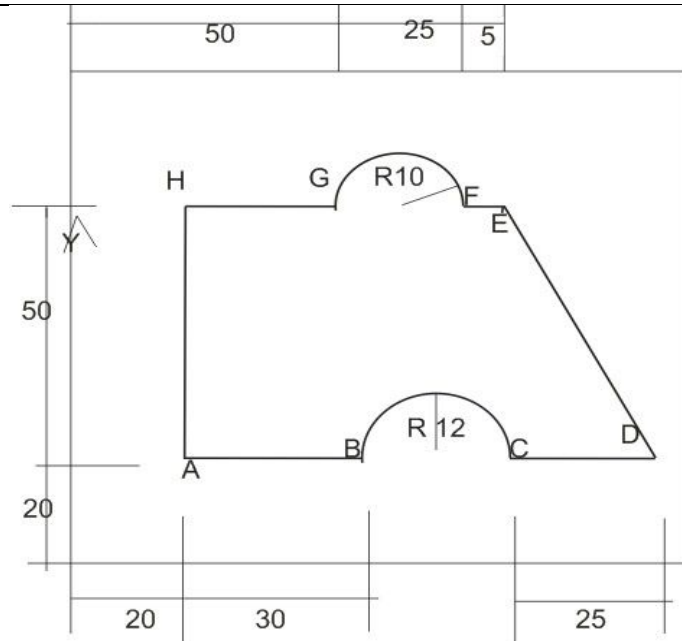
Instructions to the Students:

- 1. All the questions are compulsory.*
- 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.*
- 3. Use of non-programmable scientific calculators is allowed.*
- 4. Assume suitable data wherever necessary and mention it clearly.*

	(Level/CO)	Marks
Q.1 Solve Any Two of the following.		12
A) Describe mechatronics system with a neat sketch and give its practical examples.	(CO1)	6
B) Explain Force sensor (Load Cell) with a neat sketch by using strain gauge.	(CO1)	6
C) Discuss the working of AC Motor with a neat sketch and state its advantages.	(CO3)	6
Q.2 Solve Any Two of the following.		12
A) Describe the Data Acquisition System with a block diagram. List any two practical examples.	(CO2)	6
B) Draw a neat diagram of a Seven segment display system? Explain it with an example.	(CO2)	6
C) Explain with a neat sketch On/Off Controller.	(CO6)	6
Q.3 Solve Any Two of the following.		12
A) Explain the sequencing of pneumatic cylinders using cascade method.	(CO3)	6
B) Give the comparison between pneumatic systems and hydraulic systems.	(CO3)	6
C) Derive model equation of a mechanical system for mass and spring.	(CO5)	6
Q.4 Solve Any Two of the following.		12
A) Explain with a block diagram 8081 microcontroller and its architecture.	(CO4)	6
B) Describe with a neat sketch Programmable Logic Controller (PLC).	(CO4)	6
C) Explain with a sketch of pressure sensor? Give few applications of it.	(CO1)	6
Q.5 Solve Any Two of the following.		12
A) Explain with a neat sketch of Proportional- Integral -Derivative (PID) Controller.	(CO6)	6
B) Explain the Closed Loop Control System with a suitable example.	(CO5)	6
C) Describe with a neat sketch Proportional- Derivative (PD) Controller	(CO6)	6

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE			
Winter Examination – 2022			
Course: B. Tech.		Branch: Mechanical Engg. Semester : VII	
Subject Code & Name:BTMEC702 CAD/CAM			
Max Marks: 60		Date:30/01/2023	
Duration: 3 Hr.			
Instructions to the Students:			
1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
Q.1	Solve Any Two of the following.		12
A)	Explain minimum three cursor control devices used as CAD input device.	CO-01	6
B)	A triangle with its coordinates A (1, 1), B (5, 1), and C (3, 4); is to be rotated about point 'A' by 30 degrees in counterclockwise direction. Carry out the transformations and find out the final coordinates of the transformed triangle.	CO-02	6
C)	Describe any three methods for defining line in a graphics software.	CO-01	6
Q.2	Solve Any Two of the following.		12
A)	Compare the CSG and B-Rep methods as a modeling technique for CAD.	CO-03	6
B)	What are the various windowing applications in CAD? Explain with the help of neat sketches and suitable examples.	CO-02	6
C)	Explain various types of Robotic Configurations based on work envelope.	CO-07	6
Q.3	Solve Any Two of the following.		12
A)	What are the advantages of "Point to point control" in CNC systems? Also mention in which particular applications it will be recommended?	CO-05	6
B)	Write NC program for finishing operation of turning of the job as shown in following figure.	CO-05	6
<p style="text-align: center;">All dimensions are in mm</p>			
C)	Write NC program for finishing operation of milling of outer surface of the job as shown in following figure.	CO-05	6



All the dimensions are in mm

Q.4	Solve Any Two of the following.		12
A)	Explain the terms: A. Field variables B. Shape function C. Stiffness matrix	CO-06	6
B)	Explain various properties of stiffness matrix	CO-06	6
C)	Explain various advantages of Finite Element Methods	CO-06	6
Q. 5	Solve Any Two of the following.		12
A)	Explain various types of layouts used in a manufacturing industry.	CO-07	6
B)	What is composite part in Group Technology? What are its advantages?	CO-08	6
C)	Explain the generative CAPP system.	CO-08	6
*** End ***			

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE Winter Examination – 2022 Course: B. Tech. Branch : Mechanical Engineering Semester :VII Subject Code & Name: BTMEC703 Manufacturing Processes-III Max Marks: 60 Date: 01/02/2023 Duration: 3 Hrs.			
Instructions to the Students: 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
Q. 1	Solve Any Two of the following.		12
A)	Describe with sketch the working and construction of recirculating ball screw used in CNC machine tools.	(CO1)	6
B)	Write short note on spindle drives.	(CO1)	6
C)	State advantages and limitations of CNC machine tools.	(CO1)	6
Q.2	Solve Any Two of the following.		12
A)	Discuss work holding devices for CNC machines.	(CO2)	6
B)	Explain with neat sketch, axis designation for CNC vertical milling machine.	(CO2)	6
C)	Explain the terms: i) Rapid positioning. ii) Linear interpolation.	(CO2)	6
Q. 3	Solve Any Two of the following.		12
A)	Describe the working of LBM with neat sketch.	(CO3)	6
B)	Explain the Wire EDM with its benefits and applications.	(CO3)	6
C)	Explain the process of water jet machining.	(CO3)	6
Q.4	Solve Any Two of the following.		12
A)	Write short note on electroforming.	(CO4)	6
B)	Write advantages, disadvantages and applications of ion implantation.	(CO4)	6
C)	Describe with a neat sketch micromachining process for creating free standing structures of computer microchips.	(CO6)	6
Q. 5	Solve Any Two of the following.		12
A)	Explain the working principle, and process details of selective laser sintering with advantages and disadvantages.	(CO5)	6

B)	Explain briefly the laminated object manufacturing.	(CO5)	6
C)	What is MEMS? Explain materials used for MEMS manufacturing.	(CO6)	6
	*** End ***		

The grid and the borders of the table will be hidden before final printing.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE Supplementary Examination Summer – 2023 Course: B. Tech. Branch : Mechanical Engineering Semester :VII Subject Code & Name: BTMEC703 & Manufacturing Processes - III Max Marks: 60 Date: Duration: 3 Hr.			
Instructions to the Students: 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
Q. 1	Solve Any Two of the following.		12
A)	Explain with neat sketches the interpolations performed in CNC machining operations.	(CO1)	6
B)	Distinguish with a neat sketch between P-T-P and continuous path motion control systems in CNC Machines.	(CO1)	6
C)	Explain with a neat sketch the mechanism of feedback system employing rotary encoder in CNC Machines.	(CO1)	6
Q.2	Solve Any Two of the following.		12
A)	What do you understand by automatic tool changer? Describe in brief any two types with the help of sketches.	(CO2)	6
B)	Illustrate the program starting declarations so that the CNC machine will execute the desired machining operations.	(CO2)	6
C)	Write down programming codes for performing following functions on CNC Machines: Absolute programming, Incremental Programming, Rapid tool positioning, Circular interpolation(CCW), Spindle Start(Clockwise) and Coolant On.	(CO2)	6
Q. 3	Solve Any Two of the following.		12
A)	Explain with a neat sketch the construction and working principle of LBM process.	(CO3)	6
B)	What is the principle of EDM process? Describe advantages, limitations & applications of EDM process over conventional machining processes.	(CO3)	6
C)	Explain with a neat sketch the electrochemical machining process. State its advantages over the traditional machining processes.	(CO3)	6

Q.4	Solve Any Two of the following.		12
A)	What are the properties obtained by electroplating process? Explain with a neat sketch the principle of electroplating.	(CO4)	6
B)	Describe with suitable sketch physical vapour deposition process. State important applications of PVD.	(CO4)	6
C)	Describe in brief the steps in micro-fabrication process LIGA. Describe advantages of LIGA over other processes.	(CO6)	6
Q. 5	Solve Any Two of the following.		12
A)	State the advantages of Rapid Prototyping processes over traditional manufacturing processes. Distinguish between additive and subtractive manufacturing processes.	(CO5)	6
B)	Describe Solid Ground Curing (SGC) process. State its advantages and limitations.	(CO5)	6
C)	Differentiate between surface and bulk micromachining of MEMS.	(CO6)	6
	*** End ***		

The grid and the borders of the table will be hidden before final printing.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE Winter Examination – 2022 Course: B. Tech. Branch: Mechanical Semester : VII Subject Code & Name: Refrigeration and Air Conditioning (BTMEC704E) Max Marks: 60 Date: 07-02-2023 Duration: 2:00 p.m to 5:00 p.m																					
Instructions to the Students: 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly. 5. Use of steam table, Refrigerant property tables, Psychrometric charts is allowed																					
		(Level/CO)	Marks																		
Q. 1	Solve Any Two of the following.		12																		
A)	A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35 °C and the lower temperature is -15°C. The capacity is to be 12 tones. Determine i.COP, ii. Heat rejected from the system per hour	Apply /CO1	6																		
B)	Explain primary and secondary refrigerants	Understand/CO1	6																		
C)	Define C.O.P and Prove that C.O.P of heat pump is > C.O.P of refrigerator	Understand/CO1	6																		
Q.2	Solve Any Two of the following.		12																		
A)	Explain the effect of subcooling of condenser with the help of T-S & P-H diagram in vapour compression system	Understand/CO2	6																		
B)	An R-22 refrigeration system operates between -15 °C and 40 °C. Mass flow rate is 0.2 kg/sec. The condensate is subcooled by 5°C and vapor leaves the evaporator with degree of super heat as 10 °C. Determine i.TR, ii.COP, iii.Power required, iv.Heat rejected in condenser Use following data:	Apply /CO2	6																		
	<table border="1"> <thead> <tr> <th>T(°C)</th> <th>P (bar)</th> <th>h_f (KJ/Kg)</th> <th>h_g (KJ/Kg)</th> <th>S_f (KJ/Kg)</th> <th>S_g (KJ/Kg)</th> </tr> </thead> <tbody> <tr> <td>-15</td> <td>2.964</td> <td>28.36</td> <td>245.36</td> <td>0.115</td> <td>0.9555</td> </tr> <tr> <td>40</td> <td>15.267</td> <td>95.40</td> <td>261.38</td> <td>0.3466</td> <td>0.8767</td> </tr> </tbody> </table> Cp (Condenser) = 0.82 KJ/Kg K, Cp (Evaporator) = 0.64 KJ/Kg K	T(°C)	P (bar)	h _f (KJ/Kg)	h _g (KJ/Kg)	S _f (KJ/Kg)	S _g (KJ/Kg)	-15	2.964	28.36	245.36	0.115	0.9555	40	15.267	95.40	261.38	0.3466	0.8767		
T(°C)	P (bar)	h _f (KJ/Kg)	h _g (KJ/Kg)	S _f (KJ/Kg)	S _g (KJ/Kg)																
-15	2.964	28.36	245.36	0.115	0.9555																
40	15.267	95.40	261.38	0.3466	0.8767																
C)	Described the mechanism of a simple vapour compression refrigeration system	Remember/CO5	6																		

Q. 3	Solve Any Two of the following.		12
A)	Explain multistage compression with flash gas removal & flash inter cooling	Understand/ CO3	6
B)	Explain practical aqua-ammonia vapour absorption system,	Understand/ CO3	6
C)	Discuss the desirable properties of refrigerants used in vapour compression refrigeration systems.	Understand/ CO4	6
Q.4	Solve Any Two of the following.		12
A)	The readings from a sling psychrometer are as follows: Dry bulb temperature = 30 ⁰ C Wet bulb temperature = 20 ⁰ C ; Barometer reading = 740mm of Hg. Using steam tables, determine: 1. Dew point temperature; 2. Relative humidity; 3. Specific humidity; 4. Degree of saturation; 5. Vapour density; and 6. Enthalpy of mixture per kg of-dry air.	Apply /CO4	6
B)	Define human comfort also explain thermal exchange between human body & environment	Remember/ CO5	6
C)	Explain BPF of Heating and Cooling coil	Understand/ CO5	6
Q. 5	Solve Any Two of the following.		12
A)	39.6 m ³ /min of a mixture of re-circulated room air and outdoor air enters cooling coil at 31°C dry bulb temperature and 18.5°C wet bulb temperature. The effective surface temperature of the coil is 4.4°C. The surface area of the coil is such as would give 12.5 kW of refrigeration with the given entering air state. Determine the dry and wet bulb temperatures of the air leaving the coil and the by-pass factor.	Apply /CO4	6
B)	What are general rules for duct design? Explain velocity reduction method for duct design.	Apply /CO5	6
C)	Explain with neat sketch split air conditioning system	Understand/ CO5	6
	*** End ***		