ARKA JAIN University Jharkhand	NAAC GRADE A ACCREDITED UNIVERSITY	[07-05-2025] **END SEM EXAMINATION** **School of Engineering & IT**	
Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Manufacturing Process-II**	**Session**	**Even 2024-2025**
Semester	**VI**	**Year**	**May, 2025**
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s).**		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	Define depth of cutting.	2	CO1	K2
ii	Write the tool designation in ORS system	2	CO1	K1
iii	Evaluate the advantages and of automatic lathe.	2	CO2	K2
iv	Elaborate about cutting tool materials and its factors.	2	CO2	K1
v	What are the different forces acting on a single point in turning?	2	CO3	K1
vi	Analyse the significance the Taylor's Equation	2	CO3	K2
vii	Define reaming	2	CO4	K2
viii	Elaborate about chip thickness ratio and its factors.	2	CO4	K1
ix	Identify effects of built-up edge formation	2	CO5	K4
x	Write the tool designation in ASA system	2	CO5	K2

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Analyze the factors affecting the accuracy and efficiency of thread cutting methods in lathes	05	CO1	K5
3	Compare orthogonal and oblique metal cutting. In which applications would each type be more suitable, and why?	05	CO1	K3
4	Explain the parameters that control the tool life of a single point cutting tool.	05	CO2	K5
5	A machinist is experiencing excessive tool wear while machining a hard metal. Suggest suitable cutting tool materials and cutting fluid to improve tool life	05	CO2	K5
6	During orthogonal cutting a bar of 90 mm diameter is reduced to 87.6 mm. If the mean length of the cut chip is 88.2 mm and rake angle is 15°, calculate: (i) Cutting ratio (ii) Shear angle	05	CO4	K3
7	What are the different types of broaching machines?	05	CO4	K4

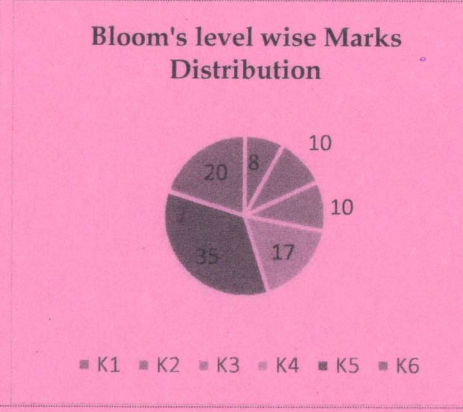
Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

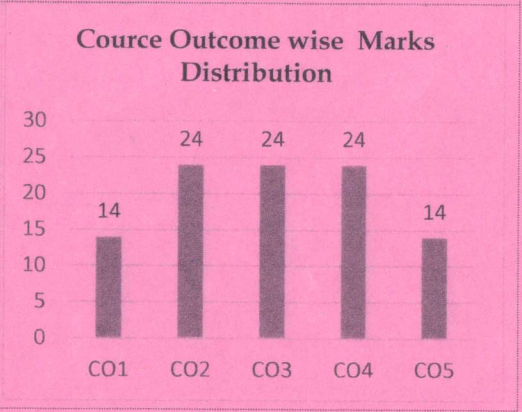
Q. No.	QUESTIONS	Marks	COs	KL
8	Evaluate the effectiveness of micromachining in the production of small, precise components. What are the main challenges and advantages of using micromachining techniques in the aerospace and electronics industries?	10	CO3	K5
9	Compare and contrast conventional grinding and centreless grinding in terms of precision, productivity, and applications. Which process is more suitable for high-volume production and why?	10	CO2	K6
10	Design a step-by-step manufacturing plan to produce a helical gear using the gear hobbing process.	10	CO3	K5
11	What are the main parts of a shaper machine? What factors influence the cutting speed in a shaper machine?	10	CO4	K4
12	Explain the working principle of a shaper with a neat sketch.	10	CO5	K6

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Remembering the basic theories of machining and selection of machine tool.
	CO2	Understanding the principles behind working of each machine tools
	CO3	Applying the knowledge of kinematics in the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.
	CO4	Analyzing the basic functions of different machine tools.
	CO5	Evaluating different formulas used in analysis of machining operations

GRAPHICAL REPRESENTATION

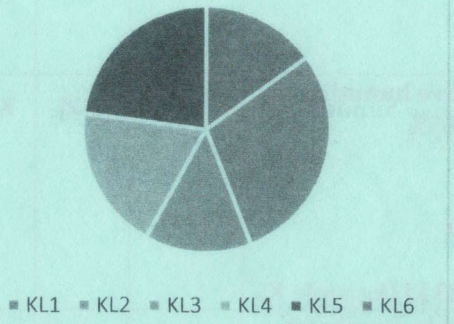


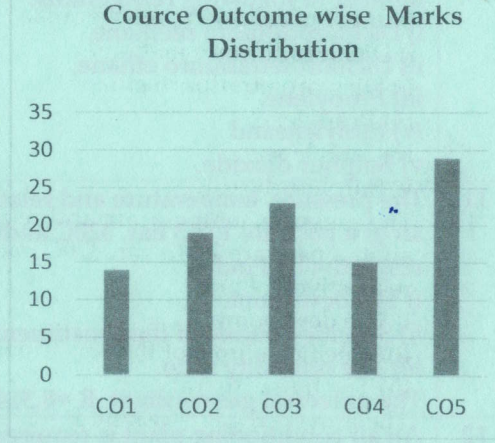


CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Understanding the various thermodynamic cycles used in refrigeration and air conditioning.
	CO2	Applying the knowledge of basic science in refrigeration.
	CO3	Analyzing various theories and their mathematical equations by real data.
	CO4	Evaluating performance of different refrigeration system.
	CO5	Creating curiosity to learn about new development in field of refrigeration and A.C.

GRAPHICAL REPRESENTATION





ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

[09-05-2025]
END SEM EXAMINATION
School of Engineering & IT

Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Refrigeration & Air Conditioning**	**Session**	**Even, 2024-2025**
Semester	**VI**	**Year**	**May, 2025**

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **RAC Data Book Can be allowed**
- **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s)**.

Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	Define C.O.P.	2	CO1	KL1
ii	State the applications of refrigeration.	2	CO1	KL3
iii	Draw the T-S and p-h diagram for vapour compression refrigeration systems.	2	CO2	KL2
iv	List the different methods of improving the COP of simple vapour compression.	2	CO3	KL1
v	What is the function of an absorber in vapour absorption system?	2	CO2	KL1
vi	How to improve the COP in aqua-ammonia vapour absorption system?	2	CO3	KL3
vii	How the refrigerants are classified?	2	CO3	KL2
viii	Explain the concept of greenhouse effect?	2	CO3	KL4
ix	Define sensible and latent heat.	2	CO5	KL2
x	What are the various losses in the duct?	2	CO5	KL2

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Derive the expression for air refrigeration system working on reversed Carnot cycle.	5	CO1	KL2
3	Explain the different methods of improving the COP of simple vapour compression Refrigeration cycle.	5	CO1	KL2
4	Describe a simple vapour compression cycle giving clearly its flow diagram.	5	CO2	KL4
5	Explain with a flow diagram, the working of aqua-ammonia vapour absorption refrigeration system.	5	CO4	KL1
6	Explain the various desirable properties of ideal refrigerants.	5	CO3	KL4
7	List out the various psychrometry processes. Explain the process of heating and humidification.	5	CO5	KL3

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	An air craft moving with speed of 1000 km/h uses simple gas refrigeration cycle for air conditioning. The ambient pressure and temperature are 0.35 bar and -10^{0}C respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25^{0}C. Determine: the temperature and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100 TR. Take CP=1.005 kJ/kg K; R=0.287 kJ/kg K and C_P/C_V=1.4 for air.	10	CO2	KL4
9	A refrigerating machine using R-12 as refrigerant operates between the pressures 2.5 bar and 9.0 bar. The compression is isentropic and there is not under cooling in the condenser. The vapour is dry and saturated condition at the beginning of the compression. Estimate the theoretical COP. If the actual COP is 0.65 of theoretical COP, calculate the net cooling produced per hour. The refrigerant flow is 5 Kg/min.	10	CO3	KL4
	Take specific heat of superheated vapour at 9 bar as **Sat. Temp. (^{0}C) / Pressure (bar) / Enthalpy (kJ/kg) Liquid / Enthalpy (kJ/kg) Vapour / Entropy (kJ/kgK) Vapour** 36 / 9.0 / 70.55 / 201.8 / 0.6836 -7 / 2.5 / 29.62 / 184.5 / 0.7001 0.64 kJ/kg The properties of refrigerant are : K.			
10	Mention the chemical formula and the refrigerant number of following refrigerants: i) Dichlorodifluoro methane, ii) Dichlorotetrafluoro ethane, iii) Propylene, iv) Ethlyleneand v) Sulphur dioxide.	10	CO4	KL2
11	The pressure, temperature and relative humidity of air at a pace are 1.013 bar, 320C and65% respectively. Find i) The dew point. ii) Specific volume of the constituent iii) The humidity ratio. The universal gas constant. R =8.3143 kJ/kg mole K.	10	CO5	KL 5
12	An air conditioning plant is required to supply 60 m^3 of air per minute at a DBT of 21◦C and 55 % RH. The outside air is at DBT of 28 ◦ C and 60 % RH. Determine the mass of water drained and capacity of the cooling coil. Assume the air conditioning plant first to dehumidify and then to cool the air. Take W1=0.0142, W2=0.0084 kj /kg of dry air, Vs2=0.845 m3 / kg, h1=64.8 kj/kg, h2=42.4 kj/kg	10	CO5	KL 4

ARKA JAIN University, Jharkhand — NAAC GRADE A, ACCREDITED UNIVERSITY			[12-05-2025] END SEM EXAMINATION School of Engineering & IT
Program	Mechanical Engineering	Branch	B. Tech
Subject Name	Elective-II - Mechatronics Systems	Session	Even, 2024-2025
Semester	VI	Year	May, 2025
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any)** • **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s)**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

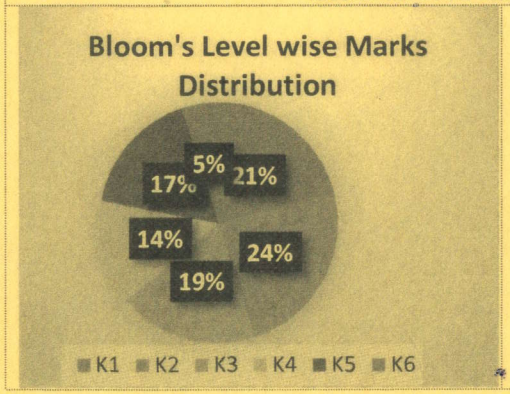
Q. N 1	QUESTIONS	Marks	COs	KL
i	Define Mechatronics and its core philosophy.	2	CO1	K1
ii	What are Scopes of Mechatronics System?	2	CO4	K2
iii	List two types of displacement sensors with examples	2	CO1	K1
iv	What is piezoelectric transducers?	2	CO1	K3
v	What are potentiometers?	2	CO3	K4
vi	Give two examples of micro-mechatronic systems.	2	CO4	K1
vii	Write difference between hydraulic and pneumatic systems.	2	CO4	K5
viii	A PT-100 RTD whose resistance at 0 °C is 100Ω. If the resistance-temperature coefficient of Platinum 4.05 x 10^{-3}/°C. Find its resistance at 100 °C.	2	CO2	K2
ix	Define LIGA process in microfabrication.	2	CO5	K4
x	Write equation of motion for Spring mass free vibration system.	2	CO5	K3

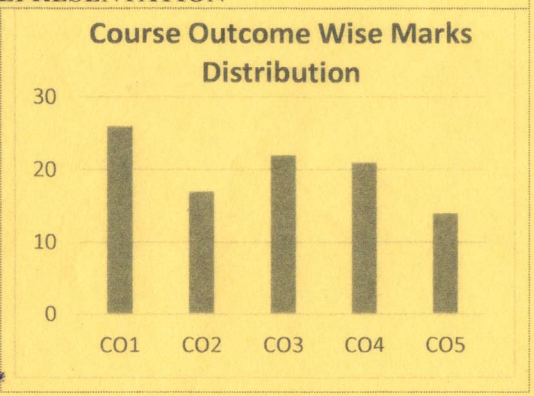
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	**QUESTIONS**	**Marks**	**COs**	**KL**
2	Explain importance of each element of a mechatronics system.	5	CO1	K1
3	What are transducers? What are different types of transducers?	5	CO3	K2
4	Explain the working principle of a capacitive proximity sensor with a diagram.	5	CO1	K3
5	Explain LVDT as displacement transducer.	5	CO2	K2
6	What are main components of a PLC system? Write ladder diagram for AND, OR and NOR gates with truth Table.	5	CO3	K6
7	Explain how a car engine management system uses mechatronics.	5	CO4	K5
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	**QUESTIONS**	**Marks**	**COs**	**KL**
8	Analyse the differences between optical sensors (Optical encoder) and Electro-mechanical sensors (Electrical generator tachometer) in terms of accuracy, response time, and applications for RPM measurement	10	CO3	K1
9	Explain Working of bourdon tube pressure gauge with schematic diagram. A bourdon tube pressure gauge requires 10 bar to produce 3 Vernier division changes in the scale. Determine its resolution.	10	CO2	K4
10	Explain sequential control of an automatic washing machine and identify how mechatronics principles improve its efficiency and functionality.	10	CO3	K5
11	Explain construction and working of Direction control valve, pressure control valve and non-return valve used in Hydraulic System with appropriate diagram.	10	CO4	K3
12	Discuss the future trends in mechatronics, focusing on AI and IoT integration.	10	CO5	K6

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Remembering the theories about various types of sensors and transducers.
	CO2	Understanding the various mechanical, electrical and pneumatic actuation systems.
	CO3	Evaluating the basic mathematical building blocks for mechanical, electrical, thermal and fluid actuation system and its interfacing of input/output requirements.
	CO4	Applying Knowledge of mechatronics in proper selection of sensor and transducer for specific purpose.
	CO5	Creating curiosity to learn new development in the field of mechatronics.

GRAPHICAL REPRESENTATION

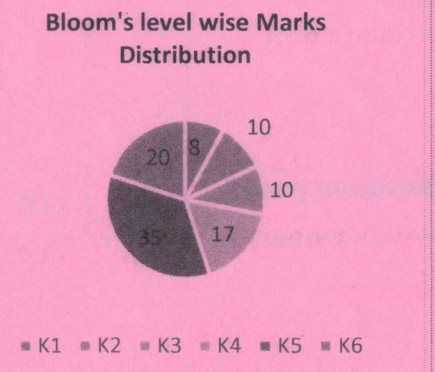


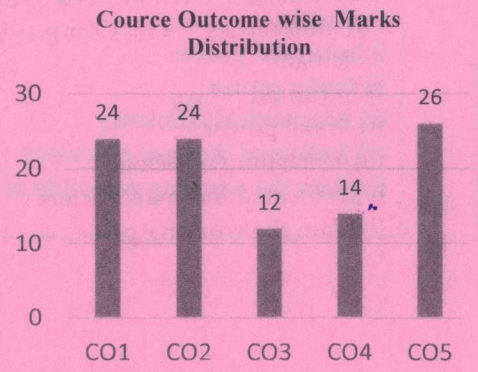


CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Understand Power cycles & Representation P-V &TS diagram.
	CO2	Describe internal combustion engine.
	CO3	Calculate various performance characteristics of IC Engines by conducting trial.
	CO4	Understand working of gas turbines and its application.
	CO5	Analyze variables affecting it in various types of IC engines.

GRAPHICAL REPRESENTATION





JGI	**ARKA JAIN University** Jharkhand	NAAC GRADE A ACCREDITED UNIVERSITY

[14-05-2025]
END SEM EXAMINATION
School of Engineering & IT

Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Elective-I - Internal Combustion Engines**	**Session**	**Even, 2024-2025**
Semester	**VI**	**Year**	**May, 2025**

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s)**.

Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	State the application of CI engines?	2	CO1	K2
ii	Write the advantages of two stroke engine?	2	CO1	K1
iii	What is the purpose of carburetor?	2	CO2	K2
iv	What is CRDI?	2	CO2	K1
v	Write the limitations or drawbacks of supercharging?	2	CO4	K1
vi	What is brake thermal efficiency?	2	CO4	K2
vii	Write the characteristics of the cooling system?	2	CO5	K2
viii	Mention the different types of lubrication system?	2	CO5	K1
ix	Mention the effect of supercharging?	2	CO3	K4
x	What is abnormal combustion?	2	CO5	K2

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Find the derivation to calculate the thermal efficiency for Constant Pressure heat addition cycle?	05	CO1	K5
3	A gas engine operating on the ideal Otto cycle has a compression ratio of 6:1. The pressure and temperature at the commencement of compression are 1 bar and 27°C. Heat added during the constant volume combustion process is 1170 kJ/kg. Determine the peak pressure and temperature and work output per kg of air and the air standard efficiency.	05	CO1	K3
4	Explain the working principle of Simple carburettor?	05	CO3	K5
5	Explain briefly the Stages of combustion in SI Engine?	05	CO5	K5
6	Briefly explain with neat sketch about the Splash type lubrication system?	05	CO5	K3
7	Briefly explain about various types combustion chamber designed for SI engines?	05	CO3	K4

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	An engine working with dual cycle has a compression ratio of 10 and 2/3 of heat of combustion is liberated at constant volume and the remainder at constant pressure. The pressure and temperature at the beginning are 1 bar and 27°C. and the maximum pressure is 40 bar. Find the temperature at the end of compression and expansion. And the air standard efficiency. Assume $\gamma = 1.4$	10	CO1	K5
9	A simple carburettor is designed to supply 6 kg of air per minute and 0.4 kg of fuel per minute. The density of the fuel is 770 kg/m3. The air is initially at 1 bar and 17 C. Calculate the venture throat diameter if the velocity of air at throat is 100 m/s. Assume Cda=0.84. Cdf=0.65 and γ=1.4. If the pressure drop across the fuel metering orifice is 0.85 of the pressure at the throat.	10	CO2	K6
10	Briefly explain about the ignition timing with respect load and speed?	10	CO4	K5
11	The following particulars were obtained in a trial on a four stroke gas engine: Duration of trial = 1 hour, Revolutions = 14000, Number of missed cycle = 500, Net brake load = 1470 N, Mean effective pressure = 7.5 bar, Gas consumption = 20000 liter, L.C.V. of gas at supply conditions = 21 KJ/Liter, Cylinder diameter = 250 mm, Stroke = 400 mm, Effective brake circumferences = 4 m, Compression ratio = 6.5:1 Calculate i) Indicated power ii) Brake power iii) Mechanical efficiency iv) Indicated thermal efficiency	10	CO5	K4
12	Explain the working principle of Distributor pump?	10	CO2	K6