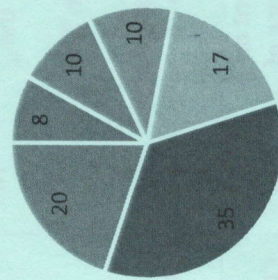


CO1	Compute thermodynamic properties for mixtures and stoichiometric balances and equivalence ratios.
CO2	To apply the knowledge of mathematics, science and engineering fundamentals to the solution of the performance of vapour power cycles and gas power cycle.
CO3	Analyze air-conditioning processes using the principles of psychrometry and Evaluate cooling and heating loads in an air-conditioning system.
CO4	Apply the thermodynamics concepts in relation to compressible flows and derive relationships between various compressible flow parameters.
CO5	Analyze the performance of air compressors and solve numericals related to the performance of single stage and multi stage air compressors

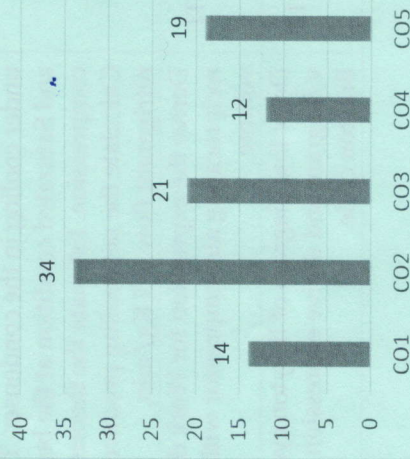
GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome wise Marks Distribution



Jgi	ARKA JAIN University Jharkhand	NAAC GRADE A ACCREDITED UNIVERSITY	[21-06-2025] END SEM EXAMINATION School of Engineering & IT
Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Applied Thermodynamics	Session	Even, 2024-2025
Semester	IV	Year	June, 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 - Steam Table, Refrigerating Table, Gas Table is 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).
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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. N1	QUESTIONS	Marks	COs	KL
i	What are secondary fuels? List some important secondary fuels.	2	CO1	K2
ii	What is adiabatic flame temperature?	2	CO1	K1
iii	Define specific steam consumption of an ideal Rankine cycle.	2	CO2	K2
iv	What is meant by work ratio? What is the importance of work ratio in vapour cycles?	2	CO2	K1
v	What is an air- standard cycle? Why such cycles are conceived?	2	CO3	K1
vi	What are the effects of providing the intercooler in the gas turbine cycle?	2	CO3	K2
vii	Define tonne of refrigeration.	2	CO4	K2
viii	List out the various psychrometric properties of air	2	CO5	K1
ix	What is net refrigerating effect of the refrigerant?	2	CO3	K4
x	Classify the various types of air compressors.	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	Derive an expression for Otto cycle efficiency with usual notation	05	CO2	K5
3	An oil engine working on the dual combustion cycle has a compression ratio 14 and the explosion ratio obtained from an indicator card is 1.4. If the cut-off occurs at 6 per cent of stroke, find the ideal efficiency.	05	CO2	K3
4	Explain the working principle of simple vapour compression of refrigeration system.	05	CO3	K5
5	Calculate the following when the DBT is 35°C, WBT is 23°C and the barometer reads 750mm Hg: i) Relative humidity ii) Humidity ratio iii) DPT iv) Density v) Enthalpy of atmospheric air.	05	CO4	K5
6	Mention the chemical formula and the refrigerant number of following refrigerants: i) Dichloro difluoro methane, ii) Dichloro tetrafluoro ethane, iii) Propylene, iv) Ethylene v) Sulphur dioxide.	05	CO4	K3
7	A single-stage double-acting air compressor is required to deliver 14 m ³ of air per minute measured at 1.013 bar and 150°C. The delivery pressure is 7 bar and the speed 300 r.p.m. Take the clearance volume as 5% of the swept volume with the compression and expansion index of $\gamma : 1.3$. Calculate: i) Swept volume of the cylinder; ii) The delivery temperature; iii) Indicated power.	05	CO5	K4

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

Q. No.	QUESTIONS	Marks	COs	KL
8	A steam power plant running on Rankine cycle has steam entering HP turbine at 20 MPa, 500°C and	10	CO1	K5

	leaving LP turbine at 90% dryness. Considering condenser pressure of 0.005 MPa and reheating occurring upto the temperature of 500°C determine, i) the pressure at which steam leaves HP turbine ii) the thermal efficiency			
9	An engine of 250 mm bore and 375 mm stroke works on constant volume cycle. The clearance volume is 0.00263 m ³ . The initial pressure and temperature are 1 bar and 50°C. If the maximum pressure is 25 bar, determine i) The air standard efficiency of the cycle and ii) The mean effective pressure.	10	CO2	K6
10	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. Calculate the net cooling produced per hour. The refrigerant flow is 5 Kg/min.	10	CO3	K5
11	Derive the expression for Work done by single stage reciprocating air compressor with clearance volume.	10	CO5	K4
12	Draw line diagram of Brayton cycle represent on p-v diagram and derive expression for efficiency of Brayton cycle.	10	CO2	K6

		ARKA JAIN University Jharkhand			[24-06-2025] END SEM EXAMINATION School of Engineering & IT	
Program	Mechanical Engineering			Branch	B. Tech	
Subject Name	Mechanical Measurement and Control			Session	Even, 2024-2025	
Semester	IV			Year	June, 2025	
Time: 3 Hour Max. Marks : 70		• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • 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 <u>Mobile Phones</u> or any kind of <u>Written Material</u>, <u>Arguments with the Invigilator</u> or <u>Discussing with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Papers.</u>				
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating			

Section A (Each question Carry 02 Marks from Q1-i to x) – 20 Marks					
Q. N	QUESTIONS	Marks	COs	KL	PO
1					
i	What are main elements in a measurement system?	2	CO1	K1	PO2
ii	Enlist different force measuring devices.	2	CO2	K3	PO2
iii	Write difference between accuracy and precision.	2	CO2	K4	PO3
iv	Write difference between active and passive transducers.	2	CO3	K2	PO3
v	Enlist different flow measuring devices.	2	CO5	K3	PO2
vi	What are advantages of open loop control system.	2	CO4	K3	PO2
vii	Enlist components of a hydraulic control system.	2	CO2	K1	PO3
viii	What do you understand by data acquisition in measurement system?	2	CO3	K3	PO3
ix	What is feedforward control system?	2	CO5	K4	PO4
x	Explain non – inverting amplifiers.	2	CO4	K2	PO4

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Enlist different performance characteristics (Properties) of a measurement system and explain.	5	CO1	K4	PO2
3	Explain working of bourdon tube pressure gauge. A bourdon tube pressure gauge requires 10 bar to produce 3 Vernier division changes in the scale. Determine its static sensitivity.	5	CO2	K2	PO2
4	What is transfer function of a close loop control system? Explain concept of poles and zeros in stability analysis.	5	CO2	K3	PO3
5	What is the principle behind working of Thermistors?	5	CO3	K3	PO3
6	Write difference between open loop and close loop control system with diagram.	5	CO5	K1	PO3
7	What factors should be considered for system modeling? Derive an equation for variation in height of liquid in a tank. Assume suitable data.	5	CO4	K2	PO4

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

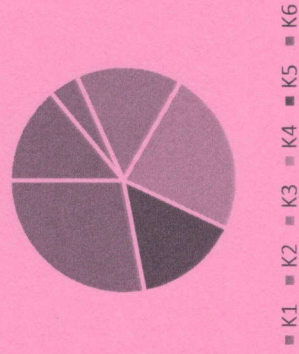
Q. No.	QUESTIONS	Marks	COs	KL	PO
8	What are proximity/displacement sensors? Explain construction and working of LVDT as displacement sensor.	10	CO2	K4	PO3
9	What is flow measurement? Explain construction and working of any one device for flow measurement which gives electrical signal.	10	CO3	K2	PO2
10	Write a note on signal conditioning and explain roles of amplifiers, filters and bridges in signal conditioning.	10	CO5	K3	PO2
11	How Piezoelectric sensors works? Explain their application is mechanical system? Name few piezoelectric Materials.	10	CO4	K3	PO3
12	Explain Following controllers i) Proportional (P) controller ii) proportional integral (PI) controller iii) Proportional Differential (PD) Controller iv) Proportional Integral differential (PID) Controller.	10	CO2	K1	PO3

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

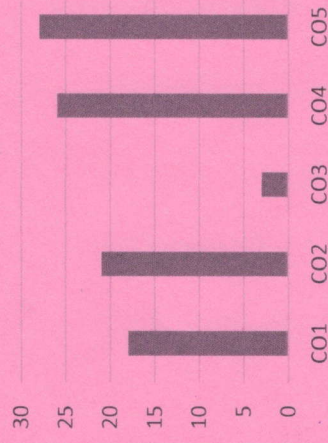
CO1	Remember the measurement systems, units and dimensions, calibration and correction.
CO2	Understand the concept of interchangeability and explain the various linear and angular measurement systems.
CO3	Apply the working principle of auto collimator, CMM and list the applications of them
CO4	Apply the various form measurements like thread, gear, straightness, flatness, roundness and surface finish
CO5	Analyze the working of miscellaneous measuring equipment for measuring temperature, velocity, pressure.

GRAPHICAL REPRESENTATION

Bloom's Level wise Marks Distribution



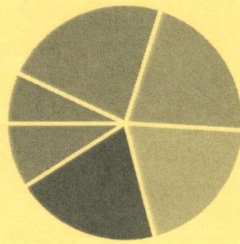
Course Outcome Wise Marks Distribution



CO1	Understand mechanisms in real life applications.
CO2	Apply static and dynamic force analysis of slider crank mechanism & kinematic analysis of simple mechanisms.
CO3	Understand the working of governors
CO4	Analyse the flywheel for engines
CO5	Evaluate moment of inertia of rigid bodies experimentally.

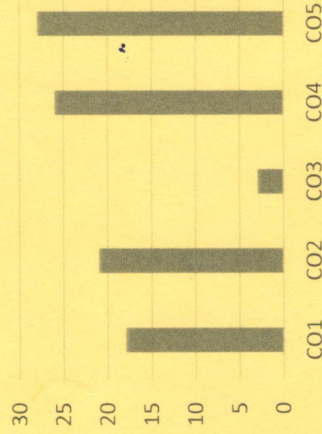
GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome Wise Marks Distribution



 ARKA JAIN University Jharkhand				[26-06-2025] END SEM EXAMINATION School of Engineering & IT	
Program	Mechanical Engineering			Branch	B. Tech
Subject Name	Theory of Machine			Session	Even, 2024-2025
Semester	IV			Year	June, 2025
Time: 3 Hour Max. Marks : 70					
• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • 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 • Graph Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) • Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will comes under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Paper(s).</u>					
Knowledge Level (KL)	K1 : Remembering			K5 : Evaluating	
	K2 : Understanding			K6 : Creating	

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

Q. N	QUESTIONS	Marks	COs	KL
1				
i	Classify the Governors.	2	CO1	KL1
ii	Distinguish between Machine and Mechanism	2	CO3	KL3
iii	State Grashof's Law.	2	CO2	KL3
iv	What are the causes and effects of unbalance?	2	CO4	KL4
v	What are the functions of bearing?	2	CO1	KL1
vi	Explain the function of gyroscope.	2	CO1	KL1
vii	Define vibration and write the different types of vibration.	2	CO3	KL3
viii	Differentiate between clutch and brake	2	CO2	KL6
ix	State the relation between time period and frequency.	2	CO2	KL3
x	What do you mean by static and dynamic balancing?	2	CO2	KL3

Section B (Answer any FOUR out of SIX) – 20 Marks

(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Draw and explain the turning moment diagram for a four-stroke engine.	5	CO1	KL1
3	Define Newton's three laws of motion. Provide examples to illustrate each law in real-world scenarios.	5	CO4	KL4
4	Define the following terms. (i) Maximum fluctuation of energy, (ii) Maximum fluctuation of speed, (iii) Coefficient of fluctuation of speed and (iv) Coefficient of Steadiness.	5	CO1	KL2
5	Explain the function of clutch and write down the name of different types of clutch and brake used in automobile.	5	CO4	KL4
6	A plate clutch has ten operating faces with inner and outer diameter of 15 cm and 25 cm respectively. It runs at 1200 r.p.m with a total end load of 4500 N. The coefficient of friction is 0.08. Find the maximum torque and power that can be transmitted in KW. Assume uniform wear condition.	5	CO4	KL1
7	Derive the expression for torque transmitted by Disc Clutch using Uniform Pressure Concept.	5	CO3	KL4

Section C (Answer any THREE out of FIVE) – 30 Marks

(Each question Carry 10 Marks)

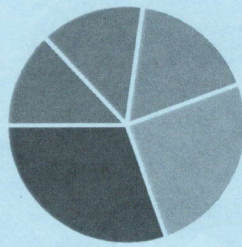
Q. No.	QUESTIONS	Marks	COs	KL
8	Define Governor and Explain working and application of any one type Governor with suitable diagram.	10	CO1	KL1
9	Explain working of any one type of dynamometer with suitable diagram.	10	CO4	KL4
10	A Porter governor has all four arms 250 mm long and pivoted on the axis of rotation. The upper and lower arms are inclined at 30° and 40° to the vertical respectively. Calculate the speed of rotation for an equilibrium position.	10	CO1	KL6
11	An aeroplane flying at a speed of 500 kmph takes right turn with a radius of 60 m. The mass of engine and propeller is 300 kg and radius of gyration is 200 mm. If the engine runs at 1600 rpm in clockwise direction when viewed from tail end, determine the gyroscopic couple and state its effect on the aeroplane. What will	10	CO1	KL1

12	be the effect if the aeroplane turns to its left instead of right? Explain Flywheel and Explain the design considerations of a flywheel used in a punching press. Why is energy storage important in such machines?	10	CO4	KL4
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Course Outcomes	CO1	Remember various properties of fluids in solving the problems
	CO2	Understand working of pumps and turbines.
	CO3	Apply Bernoulli's equation for solutions in fluids
	CO4	Analyse fluid forces - drags and lift on immersed bodies
	CO5	Evaluate the dimensionless parameters.

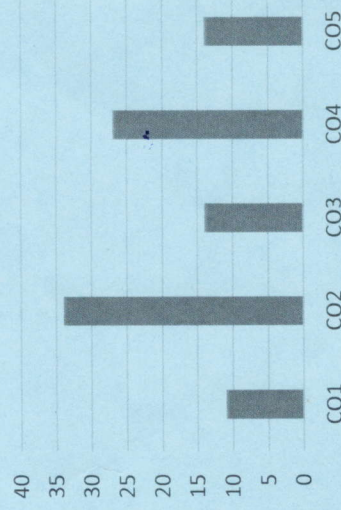
GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5

Course outcome wise Marks Distribution



ARKA JAIN University
Jharkhand

NAAC
GRADE **A**
ACCREDITED UNIVERSITY

[30-06-2025]
END SEM EXAMINATION
School of Engineering & IT

Program	Mechanical Engineering	Branch	B. Tech
Subject Name	Fluid Mechanics & Machinery	Session	Even, 2024-2025
Semester	IV	Year	June, 2025

• 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).

Time: 3 Hour
Max. Marks : 70

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)

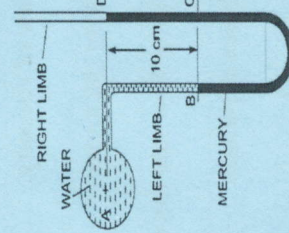
Q. N	QUESTIONS	Marks	COs	KL
i	Calculate specific weight, density and specific gravity of one litre of liquid which weights 8 N.	2	CO1	K1
ii	Write difference between laminar and turbulent flow.	2	CO5	K3
iii	What is dimensional formula for Torque and surface tension?	2	CO2	K2
iv	Define Reynold's number. Also write its formula.	2	CO4	K4
v	Write expression for continuity equation.	2	CO3	K1
vi	Define Newton's law of viscosity.	2	CO3	K2
vii	Define boundary layer thickness.	2	CO1	K5
viii	What is the formula for flow rate through nozzle?	2	CO2	K2
ix	Classify different types of pumps.	2	CO1	K4
x	What do you understand by impact of jet?	2	CO2	K2

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Define surface tension. Also write expression for pressure inside a soap bubble.	05	CO1	K1
3	The diameter of a pipe at the section 1 and 2 are 15 cm and 20 cm respectively. Find the discharge through the pipe if velocity of water at section 1 is 5 m/s. Also determine the velocity at section 2.	05	CO1	K3
4	What is capillarity? Write expression for capillary rise and fall.	05	CO3	K4
5	A plate of 0.025mm distance from a fixed plate moves at 60cm/sec and requires a force of 2 N/unit area i.e. 2 N/m^2 to maintain this speed. Determine the fluid viscosity between the plates	05	CO5	K3
6	Write difference between impulse and reaction turbine.	05	CO2	K2
7	Write a short note on draft tube used in reaction turbine	05	CO2	K5

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

Q. No.	QUESTIONS	Marks	COs	KL
8	Define following terms related to Properties of fluid i) Density or mass density ii) Specific weight or weight density iii) Specific volume iv) Specific gravity. Also calculate Sp. Weight and Sp. Gravity for cruid oil which wight 9.2 N for one litre.	10	CO1	K3
9	Define Absolute pressure, Gauge Pressure and Vacuum Pressure with help of sketch. Calculate the gauge pressure and absolute pressure inside the pipe for shown in fig. Take atmospheric pressure as 101.325KPa.	10	CO3	K4
10	What do you understand by major losses and minor losses in pipes? Enlist various minor losses with their formula.	10	CO5	K4



11	What is Dimensional Homogeneity? The time period (t) of a pendulum depends upon the length (L) of the pendulum and acceleration due to gravity (g). Derive an expression for the time period.	10	CO2	K3
12	Draw a schematic diagram of hydraulic power plant and label all the elements. Also define these terms related to turbine i. Gross head ii. Net head iii. Efficiency of a turbine	10	CO4	K5