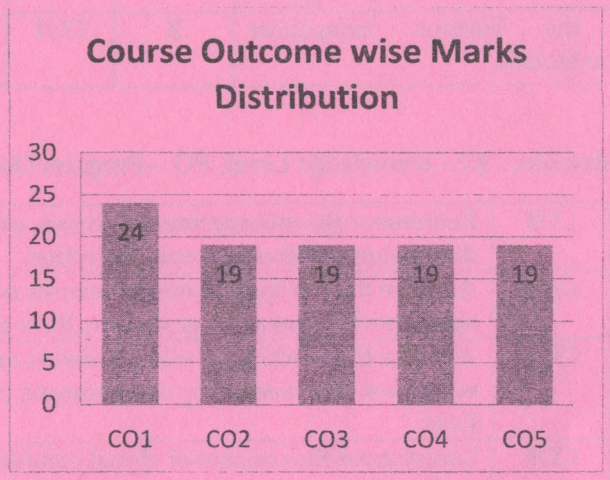


	ARKAJAIN University Jharkhand		END TERM EXAMINATION
Branch	Mechanical Engineering	Program	B.TECH
Course Name	Mechanical Measurement and Control	Semester	IV
Course Code	BTE24083	Year	2022/Even
Time: 3 Hour Maximum Marks : 70	• Start writing from 2nd page onwards; **don't Write On The 1st Page Backside** • **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 Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1a to Q1j) – 20 Marks

Q. No.1	Questions	Marks	COs	KL	PO
1a.	Explain different type Error.	2	CO1	K2	PO6
1b.	Explain the term Span and Range with respect to the measurement system.	2	CO1	K4	PO1
1c.	Explain motion, force and torque.	2	CO2	K2	PO1
1d.	What is potentiometer?	2	CO2	K2	PO5
1e.	What is diaphragm?	2	CO3	K1	PO5
1f.	Explain the applications of thermocouple.	2	CO3	K4	PO2
1g.	What is meant by data acquisition system?	2	CO4	K2	PO4
1h.	What do you understand by signal conditioning?	2	CO4	K2	PO2
1i.	With neat sketch explain open loop system.	2	CO5	K3	PO3

1j.	What is stability?	2	CO5	K2	PO2

Section B (Answer any Four out of six) – 20 Marks (Each question Carry 5 Marks)

QNO.	Questions	Marks	COs	KL	PO
2.	Classify Transducers and explain any one with diagram.	5	CO1	K3	PO6
3.	With the help of labeled sketch explain Displacement Measurement by LVDT.	5	CO2	K4	PO6
4.	With a neat sketch explain the working of manometer.	5	CO3	K3	PO2
5.	Explain the architecture of Micro processor	5	CO4	K4	PO2
6.	Write a short note on PID controller.	5	CO5	K3	PO2
7.	Define: i) Speed of response ii) Fidelity iii) Dynamic error iv) Over- shoot	5	CO1	K3	PO6

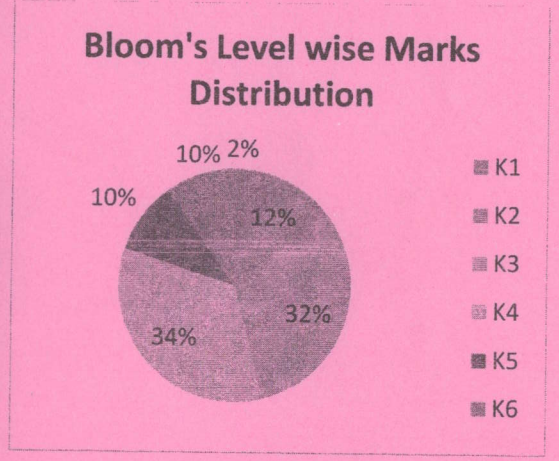
Section C (Answer any three out of Five) – 30 Marks-(Each question Carry 10 Marks)

QNO.	Questions	Marks	COs	KL	PO
8	A system is represented by the equation $S^8+5S^6+2S^4+3S^2+1=0$. Examine the stability of the system by using Routh's criterion.	10	CO5	K5	PO5
9	What are the different elastic transducers used for the pressure measurement. Illustrate the working principle of any one in detail.	10	CO2	K6	PO1
10	What is different temperature compensation techniques used in the measurement of strain using strain gauges? Explain any two methods in detail.	10	CO3	K4	PO2
11	Discuss significance of following aspects of signal conditionings for the sensors: amplification, conversion filtering, modulation and grounding	10	CO4	K4	PO2

12a.	Explain generalized measurement system elements with block diagram.	5	CO1	K3	PO5
12b.	Write the various transducer selection factors.	5	CO1	K3	PO5

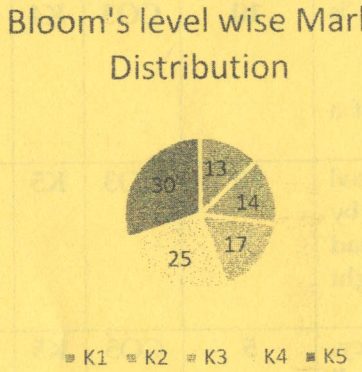
CO- Course Outcomes, KL- Knowledge Level, PO – Program Outcome

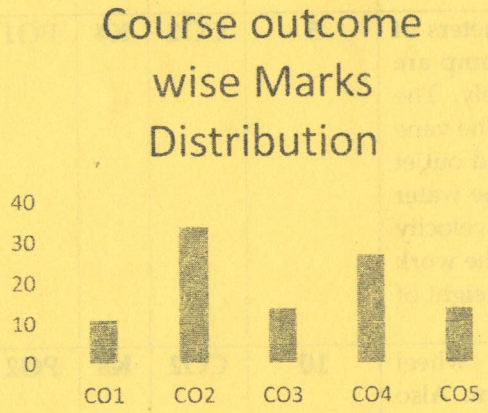
Course Outcomes	CO1	Remember the measurement systems, units and dimensions, calibration and correction.
	CO2	Analyze the working of miscellaneous measuring equipment for measuring motion, force and torque.
	CO3	Analyze the working of miscellaneous measuring equipment for measuring temperature, pressure and flow.
	CO4	Understand the concept of signal conditioning and data acquisition.
	CO5	Understand the concept of control system and stability analysis.



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

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.





	ARKAJAIN University Jharkhand		**END TERM EXAMINATION**
Branch	**Mechanical Engineering**	Program	**B.Tech**
Course Name	**Fluid Mechanics & Machinery**	Semester	**IV**
Course Code	**BTE24371**	Year	**2022/Even**
Time: 3 Hour Maximum 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 Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1a to Q1j) – 20 Marks

Q. No.1	QUESTION	Marks	COs	KL	PO
1a.	Define Specific gravity of any fluid. Also give value of specific gravity for two general fluids.	**2**	**CO1**	**K2**	**PO2**
1b.	Define Newton's law of viscosity.	**2**	**CO1**	**K1**	**PO3**
1c.	What are the difference between compressible and uncompressible flow?	**2**	**CO1**	**K1**	**PO3**
1d.	Define boundary layer thickness.	**2**	CO5	**K4**	**PO3**
1e.	Write dimensional formula for Power and Specific weight.	**2**	CO4	**K1**	**PO1**
1f.	Define Mach's number also explain its importance.	**2**	CO5	**K1**	**PO1**
1g.	What is turbine? How it is different from pump?	**2**	**CO2**	**K3**	**PO1**

Q. No.	QUESTION	Marks	COs	KL	PO
1h.	Classify different types of pumps.	2	CO2	K4	PO1
1i.	What do you understand by impact of jet?	2	CO3	K2	PO2
1j.	What is the formula for flow rate through nozzle?	2	CO3	K4	PO2

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

Q. No.	QUESTION	Marks	COs	KL	PO
2.	A plate 0.030 mm distance from a fixed plate, moves at 50 cm/s and requires a force of 2.2 N per unit area i. e. 2 N/m^2 to maintain this speed. Determine the fluid viscosity between the plates.	5	CO1	K1	PO2
3.	Define surface tension. Also write expression for pressure inside a soap bubble.	5	CO4	K2	PO2
4.	Distinguish between rotational and irrational flow with suitable examples.	5	CO4	K5	PO2
5.	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 4 m/s. Also determine the velocity at section 2.	5	CO4	K4	PO2
6.	Draw a schematic diagram of centrifugal pump and explain its working principle.	5	CO2	K3	PO2
7.	Write difference between impulse and reaction turbine.	5	CO2	K2	PO1

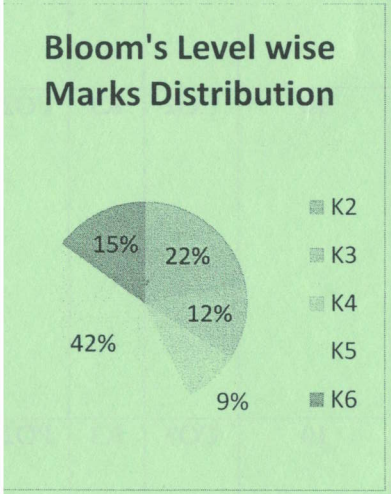
Section C (Answer any THREE out of FIVE) – 30 Marks-(Each question Carry 10 Marks)

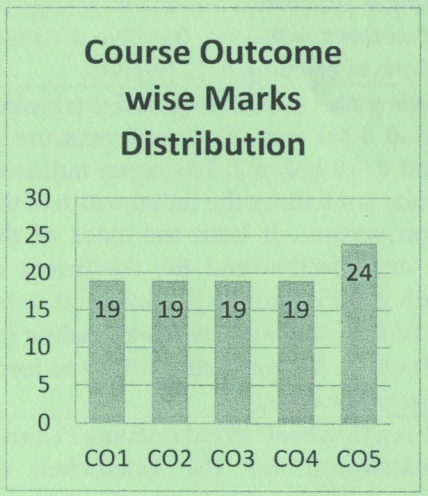
Q. No.	QUESTION	Marks	COs	KL	PO
8a.	Explain the phenomenon of variation of viscosity with temperature for fluids.	5	CO4	K4	PO2
8b.	Determine the intensity of shear of an oil having viscosity = 1 poise. The oil is used for lubricating the clearance between a shaft of diameter 10 cm and its journal bearing. The Clearance is 1.5 mm and the shaft rotates at 150 rpm.	5	CO4	K5	PO1
9.	The velocity vector in a fluid flow is given by $V= 4x^3i-10x^2yj+3tk$ Find the velocity and acceleration of a fluid particle at (2, 1, 3) at t=1.	10	CO3	K4	PO1
10.	Find the expression using dimensional analysis for the power P, developed by a pump when P depends upon the head H, the discharge Q and Specific weight w of the fluid.	10	CO3	K5	PO2
11a.	Define the term manometer efficiency, mechanical efficiency and overall efficiency in context of centrifugal pump.	5	CO5	K5	PO2
11b.	The internal and external diameters of the impeller of a centrifugal pump are 150mm and 300mm respectively. The pump is running at 1200 rpm. The vane angle of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	5	CO2	K4	PO1
12.	Explain working of Pelton wheel turbine with schematic diagram. Also write formula for different efficiencies involved in calculation of performance of a turbine.	10	CO2	K5	PO2

11.	A porter governor having each of its four arms of 400 mm. The upper arms are pivoted on the axis of the sleeve, whereas the lower arms are attached to the sleeve at a distance of 45 mm from the axis of rotation. Each ball has a mass of 8 kg and the load on the sleeve is 60 kg. Determine the equilibrium speeds for two extreme radii of 250 mm and 300 mm of rotation of the balls.	10	CO4	K5	PO2
12.	Explain shaking forces and shaking moments. Derive their expressions for a four bar linkage.	10	CO5	K6	PO1

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

Course Outcomes	CO1	Understand mechanisms in real life applications.
	CO2	Apply static and dynamic force analysis of slider crank mechanism & kinematic analysis of simple mechanisms.
	CO3	Analyse the flywheel for engines.
	CO4	Analyse the governor for engines.
	CO5	Understand the dynamics of machines.





	ARKAJAIN University Jharkhand		END TERM EXAMINATION
Branch	Mechanical Engineering	Program	B.TECH
Course Name	Theory of Machines	Semester	IV
Course Code	BTE24276	Year	2022/Even
Time: 3 Hour Maximum 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 Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1a to Q1j) – 20 Marks

Q. No.1	Questions	Marks	COs	KL	PO
1a.	Explain gyroscopic couple?	2	CO1	K2	PO2
1b.	Calculate gyroscopic couple acting on a disc which has radius of 135 mm. Angular and precessional velocities are 15 rad/sec and 7 rad/sec respectively. Assume density = 7810 kg/m3 and thickness of disc = 30 mm	2	CO1	K5	PO3
1c.	What is a brake? What is the difference between a brake and a clutch?	2	CO2	K3	PO3
1d.	What is Clutch? Give the classification of clutches	2	CO2	K2	PO2
1e.	Why flywheels are used in punching machines?	2	CO3	K4	PO1
1f.	What are the functions of flywheel in a machine?	2	CO3	K2	PO1

1g.	What is the function of a governor?	2	CO4	K2	PO2
1h.	Prove that a governor is stable if dF/dr > F/r, Where F is controlling force and r is corresponding radius of rotation	2	CO4	K4	PO3
1i.	Explain Inertia Force with neat sketch	2	CO5	K2	PO2
1j.	Explain D'Alemberts Principle with neat sketch	2	CO5	K2	PO1

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

Q NO	Questions	Marks	COs	KL	PO
2.	Discuss the effect of the gyroscopic couple on a disc fixed at a certain angle to a rotating shaft.	5	CO1	K4	PO2
3.	What is a dynamometer? How the dynamometer differs from the brake? Explain with neat sketch, the working of any one of the transmission type Dynamometers.	5	CO2	K2	PO3
4.	The turning moment diagram for a multi cylinder engine has been to drawn to a scale of 1 mm to 500 N-m torque and 1 mm to 6° of crank Displacement. The intercepted areas between output torque curve and mean resistance line taken in order from one end in sq. mm are,-30, +410,-280,+320,-330,+250,-360,+280,-260 sq. mm when the engine Is running at 800 RPM. The engine has a stroke of 300mm and the Fluctuation of speed is not to exceed ± 2% of the mean speed. Determine a suitable diameter and cross section of the Flywheel rim for a limiting Value of the safe centrifugal stress of 7 MPa. The material density may Be assumed as 7200 Kg/m3. The width of Rim is to be 5 times the thickness	5	CO3	K5	PO2
5.	A porter governor has equal arms each 200 mm in length and pivoted on the axis of rotation. The mass of each ball is 5 kg and the mass of sleeve is 25 kg. The radius of governor is 100 mm when governor begins to lift. If the frictional increase of speed is 1 then determine the governor effort and power.	5	CO4	K5	PO1
6.	What is application of concepts to dynamic analysis of slider-crank mechanism and 4-bar mechanism?	5	CO5	K6	PO2
7.	Explain Centroid and Centre of Mass, Mass Moments and products of Inertia	5	CO5	K2	PO2

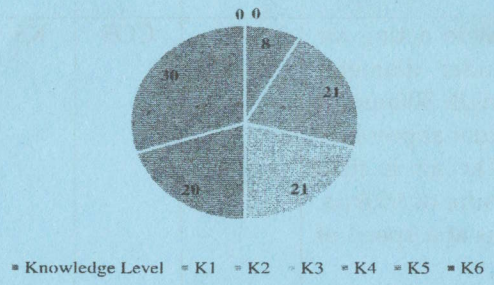
Section C (Answer any THREE out of FIVE) – 30 Marks-(Each question Carry 10 Marks)

Q NO	Questions	Marks	COs	KL	PO
8.	The turbine rotor of a ship has a mass of 3500 kg. It has a radius of Gyration of 0.45 m and a speed of 3000 rpm clockwise when looking from stern. Determine The gyroscopic couple and its effect upon the ship: 1. When the ship is steering to left on a curve of 100 m radius at a speed of 36Km/h 2. When the ship is pitching in a simple harmonic motion, the bow falling with Its maximum velocity. The period of pitching is 40 seconds and the total angular Displacement between the two extreme positions of pitching is 12 degrees	10	CO1	K5	PO3
9.	A single plate clutch is required to transmit 8 kW at 1000 rpm. The axial pressure is limited to 70 kN/m2. The mean radius of the plate is 4.5 times the radial width of the friction surface. If both the sides of the plate are effective and the coefficient of friction is 0.25, find the (i) inner and outer radii of the plate and the mean radius (ii) width of the friction lining (iii) axial force to engage the clutch.	10	CO2	K5	PO2
10.	What is a flywheel? What is its use? Derive a relationship for the Coefficient of fluctuation of speed in terms of maximum fluctuation of Energy and the kinetic energy of the flywheel at mean speed	10	CO3	K3	PO2

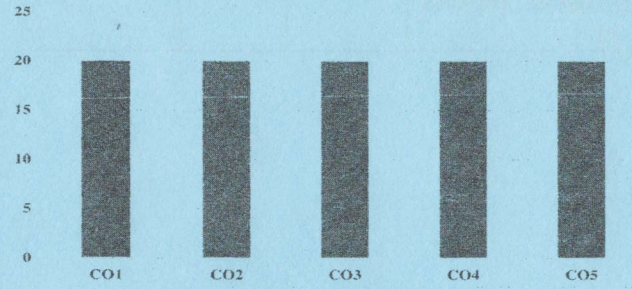
CO- Course Outcomes, KL- Knowledge Level, PO – Program Outcome

Course Outcomes	CO1	Understand fuel properties, analysis, process and handling
	CO2	Analyse the different thermodynamic cycles of to perform heat, work and efficiency calculations
	CO3	Understand the use of psychrometric chart and analyse the various psychrometric process
	CO4	Describe typical engineering flow situations in which compressibility effects are more or less predominant
	CO5	Analyse the single and multi-stage reciprocating air compressor cycles in order to carry out calculations on machine performance

Blooms Level Wise Marks Distribution



Course Outcome Wise Marks Distribution



	ARKAJAIN University Jharkhand		**END TERM EXAMINATION**
Branch	**Mechanical Engineering**	Program	**B.TECH**
Course Name	**Applied Thermodynamics**	Semester	**IV**
Course Code	**BTE24079**	Year	**2022/Even**
Time: 3 Hour Maximum 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 Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1a to Q1j) – 20 Marks

Q. No.1	Questions	Marks	COs	KL	PO
1a.	What are the different methods to improve the efficiency of gas turbines?	2	CO2	K2	1
1b.	Draw the PV diagram of diesel Cycle?	2	CO2	K2	1
1c.	Explain Dalton's Law of Partial Pressure?	2	CO3	K1	2
1d.	Define dry bulb temperature, wet bulb temperature and dew point temperature.	2	CO3	K1	2
1e.	Define calorific value.	2	CO1	K1	2
1f.	Explain proximate analysis.	2	CO1	K2	1
1g.	What is Mach Number? Explain it.	2	CO4	K2	1
1h.	What do you understand by Stagnation Temperature and Stagnation Pressure?	2	CO4	K3	1
1i.	Classify the various types of compressors.	2	CO5	K2	2

1j.	Define the term isothermal compression efficiency.	2	CO5	K1	2

Section B (Answer any Four out of six) – 20 Marks (Each question Carry 5 Marks)

QNO.	Questions	Marks	COs	KL	PO
2.	Explain the following i)Compressed natural gas (CNG) ii) Liquid petroleum gas (LPG)	5	CO1	K2	2
3.	Draw the different processes of Rankine cycle on a T-S diagram. Mention the different operations of Rankine cycle.	5	CO2	K3	1
4.	What are psychrometric processes? Explain Cooling and dehumidification.	5	CO3	K2 & K3	2
5.	Derive the expression for stagnation velocity of sound.	5	CO4	K3	2
6.	What to you mean by single stage compressor? Explain with neat diagram.	5	CO5	K2 & K3	2
7.	Derive the work done during polytropic compression. Also draw the p-V diagram of polytropic compression.	5	CO5	K3	2

Section C (Answer any three out of Five) – 30 Marks-(Each question Carry 10 Marks)

QNO.	Questions	Marks	COs	KL	PO
8.	The percentage composition by mass of a sample of coal is C = 89.3, H_2 = 5, O_2 = 3.4, N_2 = 1.5, S = 0.8, is used with 8% ash and 7% moisture. Calculate: i) Air required for combustion of 1kg coal as fired ii) Analysis of dry flue gas resulting from combustion	10	CO1	K4	3
9.	Draw and explain Rankine cycle on T-S diagrams with dry and saturated steam at turbine inlet and obtain an expression for the Rankine cycle efficiency.	10	CO2	K4 & K5	3
10.	Data for entry of air at a constant area duct are p_1 = 0.345 bar, T_1 = 314 K, c_1 = 64 m/s. If 627 kJ/kg if heat is added to the gas in the duct between entry and exit sections, determine at the exit a) pressure b) temperature c) Mach number d) velocity of gas. How much heat is required to accelerate air from initial condition to sonic condition?	10	CO4	K5	4
11.	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: i) partial pressure of Water vapour; ii) relative humidity; iii) dew point temperature; iv) specific enthalpy; and v) vapour density.	10	CO3	K5	3
12.	A Single cylinder, single acting air compressor has cylinder diameter 160mm and stroke length 300mm. It draws air into its cylinder at pressure of 100kpa at 27°C. The air is then compressed to a pressure of 650kpa. If the compressor runs at a speed of 2 rev/sec, Determine. i) Mass of air compressed per cycle ii) Work required per cycle iii) Power required to derive the compressor in KW Assume the compression process follows PV = constant.	10	CO5	K5	4