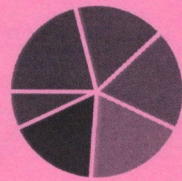


CO1	Identify and analyse the functional requirements of a fluid power transmission system for a given application.
CO2	Visualize how a hydraulic/ pneumatic circuit will work to accomplish the function.
CO3	Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro- pneumatics for a given application.
CO4	Select and size the different components of the circuit.
CO5	Develop a comprehensive circuit diagram by integrating the components selected for the given application

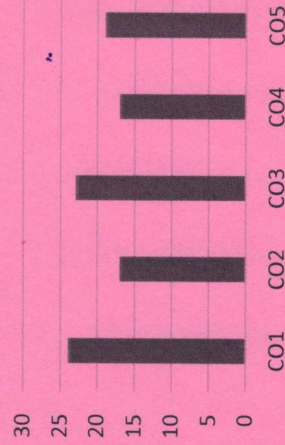
### GRAPHICAL REPRESENTATION

**Bloom's Level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome Wise Marks Distribution**



**ARKA JAIN University**  
Jharkhand



[20/01/2026]  
**END SEM EXAMINATION**  
School of Engineering & IT

Branch	Mechatronics Engineering	Program	Diploma
Subject Name	Fluid Power Engineering & Practice	Session	Odd, 2025-26
Semester	III	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; <u>don't Write on the 1st Page</u> * Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Graph Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any)</li> <li>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></li> </ul>		
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 Q1-xx) – 20 Marks

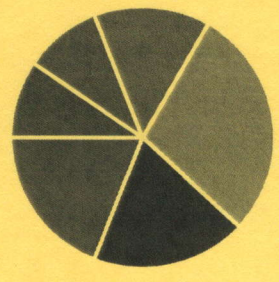
Q. N	QUESTIONS	Marks	COs	KL
i	Define Pascal's Law and state its significance in fluid power systems.	2	CO1	K1
ii	Explain the role of filters and strainers in hydraulic fluid conditioning.	2	CO2	K3
iii	Define positive displacement pump. How does it differ from a non-positive displacement pump?	2	CO2	K4
iv	Explain the function of an accumulator in a hydraulic system.	2	CO3	K2
v	Differentiate between direct-operated and pilot-operated pressure control valves with one example each	2	CO5	K3
vi	Series circuits work on both hydraulic and pneumatic actuators. a) True b) False	2	CO4	K3
vii	How pump is different from compressor?	2	CO2	K2
viii	Write difference between pressure reducing valve and pressure relief valve with symbols.	2	CO3	K3

ix	What is the difference between direct and indirect actuation in pneumatic cylinders?	2	CO5	K4
x	Explain the function of an AND logic gate in a pneumatic control circuit with a suitable example.	2	CO4	K5
<b>Section B (Answer any FOUR out of SIX) – 20 Marks</b> (Each question Carry 5 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	What type of actuators used for robotic arm movement? Suggest any one configuration with diagram.	5	CO1	K4
3	What is the function of check valve? Explain any one configuration (construction) of check valve	5	CO2	K5
4	Discuss the various factors affecting pump selection for a hydraulic system. Justify the selection of a particular pump for high-pressure applications.	5	CO2	K3
5	Explain the types and applications of accumulators and intensifiers	5	CO3	K3
6	Explain the construction and working of radial piston pump with schematic diagram.	5	CO5	K1
7	Illustrate the working of a double-acting pneumatic cylinder	5	CO4	K2
<b>Section C (Answer any THREE out of FIVE) – 30 Marks</b> (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Apply Pascal's Law to calculate the force transmitted in a hydraulic press having a small piston area of 5 cm <sup>2</sup> and a large piston area of 200 cm <sup>2</sup> when a force of 100 N is applied on the small piston.	10	CO2	K4
9	Evaluate the performance of different pressure control valves and flow control valves used in pneumatic systems. Discuss their advantages and limitations.	10	CO3	K2
10	Explain the construction and working of vane pump with schematic diagram.	10	CO5	K3
11	Explain the construction and working of axial piston pump with schematic diagram.	10	CO4	K4
12	Design a basic fluid power system layout for a hydraulic lift, indicating major components such as pump, actuator, reservoir, valves, and filters.	10	CO5	K5

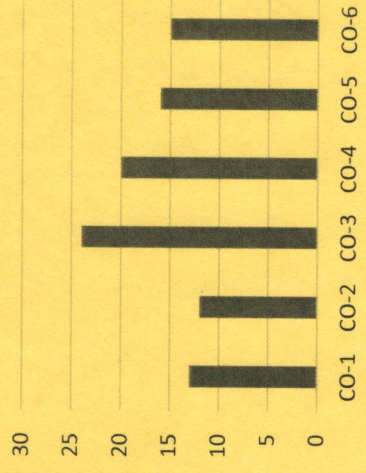
CO1	Recall and Recognize the current voltage characteristics of the current voltage characteristics of semiconductor devices
CO2	Demonstrate Operational Amplifier circuits and their applications
CO3	Apply the fundamental knowledge of analog and digital electronics to get different types of analog to digitalized signal and vice-versa converters in real world.
CO4	Analyze logic processes and implement logical operations using combinational logic circuits.
CO5	Investigate the static and dynamic characteristics of popular MOS and bipolar logic families, with emphasis on CMOS and TTL technologies.
CO6	To design and implement sequential logic circuits

**GRAPHICAL REPRESENTATION**

**Bloom's level wise Marks Distribution**



**Course Outcome wise Marks Distribution**



		[22/01/2026] END SEM EXAMINATION School of Engineering & IT
	Program Mechatronics Engineering	Branch Diploma
Subject Name Analog and Digital Circuits	Session Odd 2025-26	
Semester III	Year Jan, 2026	
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 come under Unfair Means and will Result in the Cancellation of the Paper(s).	
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
1	List out the factors on which barrier potential depends.	2	CO1	K1
i	Write characteristics of an Ideal Opamp?	2	CO2	K2
ii	Represent the following decimal numbers as 8 bit signed numbers in the 2's complement form. (i) +25 (ii) -68	2	CO4	K3
iii	Compute Truth table of EX-OR and XNOR gate with symbolic Representation?	2	CO4	K2
iv	Distinguish between combinational logic and sequential logic Circuit?	2	CO5	K1
v	Give some of the major applications of multiplexers and decoders.	2	CO4	K1
vi	Compare Synchronous and asynchronous sequential counters?	2	CO6	K2
vii	Define bidirectional shift register?	2	CO6	K3
viii	Lists advantage and disadvantages of flash type ADC?	2	CO3	K1
ix	Compute Use of ADC/DAC in Mechatronics systems?	2	CO3	K2
x				

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Draw a circuit for Inverting and non-inverting amplifier and Explain its working?	05	CO2	K1
3	Predict the dc current gain ( $\beta_{DC}$ & $\alpha_{DC}$ ) and the emitter current $I_E$ for a transistor where $I_B = 50 \mu A$ and $I_C = 3.65 mA$ .	05	CO1	K5
4	Define Digital to Analog Converters (DACs). What are the different types of DACs? Explain any one?	05	CO3	K2
5	Minimize the following function using K - map and realize it with AND, OR & NOT logic gates? $F(A, B, C, D) = \sum(0,1,2,5,8,10,11,14)$	05	CO4	K4
6	Construct the logic diagram of a full adder using only 2- input NAND gates?	05	CO5	K2
7	Discuss basic idea of PLC and microcontroller integration with analog/digital components	05	CO6	K3

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

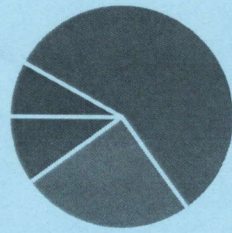
Q. No.	QUESTIONS	Marks	COs	KL
8	Elaborate the construction and operation of NPN transistor with neat sketch?	10	CO1	K3
9	Express the following hexadecimal numbers to their equivalent binary and octal numbers. i. 3AC45B.20B ii. 6754A.2FE	10	CO3	K5
10	With the help of suitable schematics, briefly describe how you would achieve TTL-to-CMOS and CMOS-to-TTL interfaces?	10	CO5	K4
11	Discuss working the Master -slave J -K flip-flop with circuit diagram?	10	CO6	K2
12	i. Draw the schematic diagram of a resistive divider D/A converter. ii. Explain operation of resistive divider D/A converter	10	CO3	K4

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

CO1	Know different machine elements and mechanisms.
CO2	Understand Kinematics and Dynamics of different machines and mechanisms.
CO3	Select Suitable Drives and Mechanisms for a particular application.
CO4	Appreciate concept of balancing and Vibration.
CO5	Develop ability to come up with innovative ideas.
CO6	Understand different types of cams and their motions and also draw cam profiles for various Motions

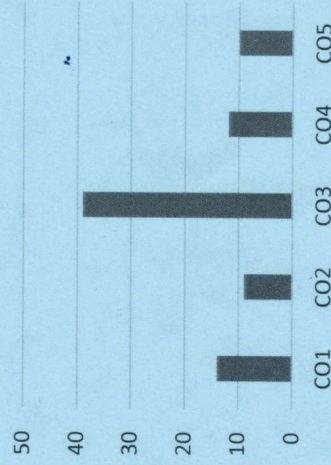
**GRAPHICAL REPRESENTATION**

**Bloom's level wise Marks Distribution**



■ KL1 ■ KL2 ■ KL3 ■ KL4 ■ KL5 ■ KL6

**Course Outcome wise Marks Distribution**



**ARKA JAIN University**  
Jharkhand



[28/01/2026]  
END SEM EXAMINATION  
School of Engineering & IT

Program	Mechatronics Engineering	Branch	Diploma
Subject Name	Theory of Machines	Session	Odd, 2025-26
Semester	III	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; <u>don't Write on the 1st Page</u> * Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any <u>Four</u> out of Six of Section B</li> <li>Answer Any <u>Three</u> out of Five of Section C</li> <li>Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will come under <u>Unfair Means</u> and will <u>Result</u> in the Cancellation of the Paper(s).</li> </ul>		
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	Define Cam and Follower.	2	CO6	KL1
ii	Write two applications of Cam and Follower.	2	CO6	KL2
iii	State the advantage of roller follower over knife-edge follower.	2	CO6	KL2
iv	Define Kinematic link with one example.	2	CO1	KL1
v	Differentiate between a machine and a structure (any 2 points).	2	CO1	KL2
vi	Define: (a) Linear velocity (b) Angular velocity.	2	CO2	KL1
vii	What is the function of a governor in an I.C. engine?	2	CO2	KL2
viii	State the application of disc brake.	2	CO3	KL2
ix	What is the function of a dynamometer?	2	CO3	KL2
x	Define Coefficient of fluctuation of speed.	2	CO4	KL1

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Differentiate between open belt drive and cross belt drive.	5	CO3	KL2
3	State the types of gear trains and explain any one.	5	CO3	KL2
4	State advantages and disadvantages of chain drive over belt drive.	5	CO3	KL2
5	Explain the slip and creep phenomenon in belts.	5	CO3	KL2
6	A shaft runs at 75 rpm and drives another shaft at 300 rpm through belt drive. The diameter of the driving pulley is 700 mm. Determine the diameter of the driven pulley in the following cases: (i) Taking belt thickness as 5 mm (ii) Assuming belt thickness 5 mm and total slip of 4%.	5	CO3	KL3
7	Explain with neat sketch the working of Watt governor.	5	CO2	KL2

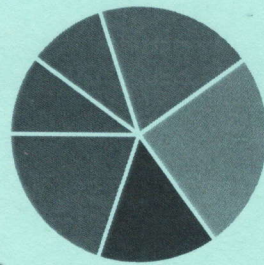
**Section C (Answer any THREE out of FIVE) - 30 Marks**  
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Draw the displacement diagram for a follower subjected to uniform velocity during rise and SHM during return with following data: Stroke = 60 mm, Angle of rise = 90°, Angle of return = 90°, Angle of dwell after return = 180°.	10	CO6	KL3
9	Suggest an innovative modification in any traditional drive system (belt, chain, or gear) to improve efficiency or reduce maintenance. Justify your idea with a neat sketch.	10	CO5	KL6
10	Explain the working of any one type of Dynamometer with neat sketch.	10	CO4	KL3
11	Draw a neat sketch of Oldham's coupling and explain its working and use.	10	CO1	KL2
12	Explain the construction and working of an internal expanding shoe brake with neat sketch.	10	CO3	KL2

CO1	Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology.
CO2	Distinguish between various types of errors.
CO3	Understand the principle of operation of an instrument and select suitable measuring device for a particular application.
CO4	Explain the concept of calibration of an instrument.
CO5	Analyze and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.

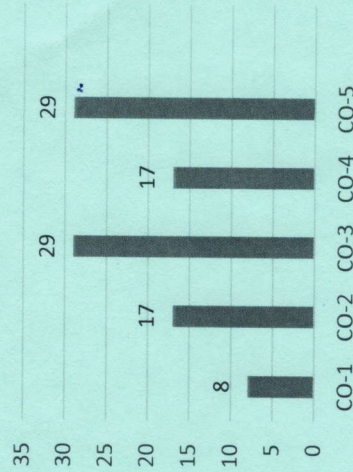
**GRAPHICAL REPRESENTATION**

**Bloom's level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome wise Marks Distribution**



Branch	Mechatronics Engineering	Program	Diploma
Subject Name	Mechanics & Metrology	Session	Odd, 2025-26
Semester	III	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; <b>don't Write on the 1st Page Backside</b></li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of Mobile Phone or any kind of <b>Written Material, Arguments with the Invigilator or Discussion with Co-Student</b> will come under <b>Unfair Means</b> and will <b>Result in the Cancellation of the Paper(s)</b>.</li> </ul>		
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
1				
i	Enlist different types of sensors used for measurement.	2	CO1	K1
ii	Enlist the properties of engineering materials.	2	CO3	K2
iii	Discuss importance of uses of tolerance given on design of a part.	2	CO3	K2
iv	What is hole basis system.	2	CO2	K1
v	What is Piezoelectric Transducer?	2	CO3	K1
vi	Explain any four characteristics of measurement system.	2	CO5	K2
vii	Define these terms i) Accuracy ii) Precession	2	CO5	K3
viii	Discuss about gear profile measuring instrument.	2	CO1	K2
ix	Define stress and strain in engineering materials.	2	CO1	K2
x	What are Strain Gauges?	2	CO4	K3

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Draw and show terminology used in metric thread.	05	CO5	K3
3	Write a note on ring gauge and plug gauge.	05	CO2	K4
4	Elaborate stress strain diagram of engineering materials.	05	CO3	K6
5	What is sine bar? Explain the procedure of angle measurement by sine bar.	05	CO5	K3
6	What do you understand by Fit in Metrology? What are different types of fits, explain in brief.	05	CO5	K6
7	What are different types of gears? Sketch a gear profile and show different elements of as gear.	05	CO4	K5

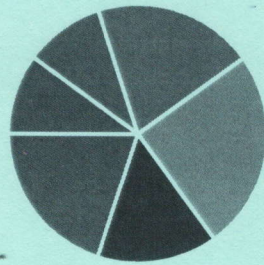
**Section C (Answer any THREE out of FIVE) - 30 Marks**  
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Explain construction and working of LVDT.	10	CO3	K5
9	Elaborate different types of engineering materials in details.	10	CO2	K6
10	Explain construction and working of instrument for Temperature measurement.	10	CO5	K4
11	Define hole basis and shaft basis system for assembly. In an interchangeable assembly, shaft of size $50^{-0.03}$ mm mates with hole of size $50^{+0.02}$ mm. find Maximum and minimum clearance and interference in the assembly.	10	CO3	K3
12	Define these Terms used in Metrology with Diagram i) Basic Size      ii) Actual Size      iii) Tolerance iv) Allowance      v) Transition Fit	10	CO4	K4

CO1	Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology.
CO2	Distinguish between various types of errors.
CO3	Understand the principle of operation of an instrument and select suitable measuring device for a particular application.
CO4	Explain the concept of calibration of an instrument.
CO5	Analyze and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.

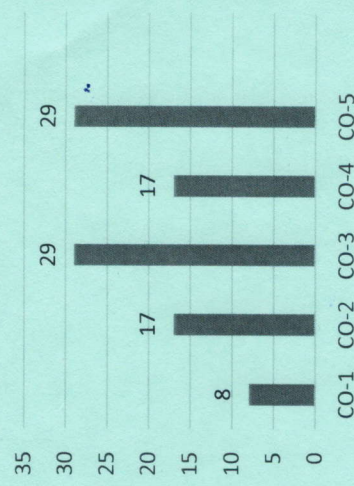
**GRAPHICAL REPRESENTATION**

**Bloom's level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome wise Marks Distribution**



**ARKA JAIN University**  
JharKhand



[17/01/2026]

END SEM EXAMINATION  
School of Engineering & IT

Branch	Mechatronics Engineering	Program	Diploma
Subject Name	Mechanics & Metrology	Session	Odd, 2025-26
Semester	III	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page</li> <li>Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Paper(s)</u>.</li> </ul>		
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
i	Enlist different types of sensors used for measurement.	2	CO1	K1
ii	Enlist the properties of engineering materials.	2	CO3	K2
iii	Discuss importance of uses of tolerance given on design of a part. What is hole basis system.	2	CO3	K2
iv	What is hole basis system.	2	CO2	K1
v	What is Piezoelectric Transducer?	2	CO3	K1
vi	Explain any four characteristics of measurement system.	2	CO5	K2
vii	Define these terms i) Accuracy ii) Precession	2	CO5	K3
viii	Discuss about gear profile measuring instrument.	2	CO1	K2
ix	Define stress and strain in engineering materials.	2	CO1	K2
x	What are Strain Gauges?	2	CO4	K3

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Draw and show terminology used in metric thread.	05	CO5	K3
3	Write a note on ring gauge and plug gauge.	05	CO2	K4
4	Elaborate stress strain diagram of engineering materials.	05	CO3	K6
5	What is sine bar? Explain the procedure of angle measurement by sine bar.	05	CO5	K3
6	What do you understand by Fit in Metrology? What are different types of fits, explain in brief.	05	CO5	K6
7	What are different types of gears? Sketch a gear profile and show different elements of as gear.	05	CO4	K5

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

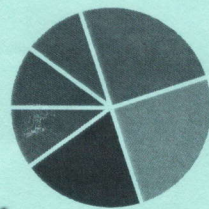
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain construction and working of LVDT.	10	CO3	K5
9	Elaborate different types of engineering materials in details.	10	CO2	K6
10	Explain construction and working of instrument for Temperature measurement.	10	CO5	K4
11	Define hole basis and shaft basis system for assembly. In an interchangeable assembly, shaft of size $50^{-0.03}$ mm mates with hole of size $50^{+0.02}$ mm. find Maximum and minimum clearance and interference in the assembly.	10	CO3	K3
12	Define these Terms used in Metrology with Diagram i) Basic Size      ii) Actual Size      iii) Tolerance iv) Allowance      v) Transition Fit	10	CO4	K4

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

Course Outcomes	CO1	Acquire knowledge about Mathematical modeling, Block diagram algebra, signal flow graphs and control system components.
	CO2	Learn the features of time response analysis of various systems.
	CO3	Finding out steady state error and error constants.
	CO4	Analysis of system stability in Root locus technique.
	CO5	Understand about frequency response analysis of control system.
	CO6	Apply Nyquist plot for judgments about stability of a system.

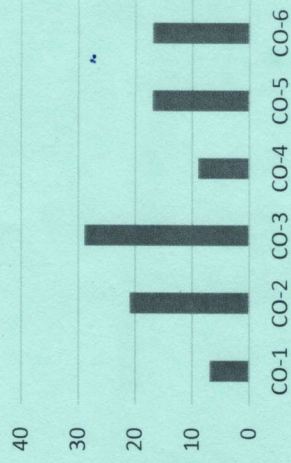
**GRAPHICAL REPRESENTATION**

**Bloom's level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome wise Marks Distribution**



**ARKA JAIN University**  
Jharkhand



[30/01/2026]

END SEM EXAMINATION  
School of Engineering & IT

Branch	Mechatronics Engineering	Program	Diploma
Subject Name	Control System	Session	Odd, 2025-26
Semester	III	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; <b>don't Write on the 1st Page Backside</b></li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of <u>Mobile Phone</u> or any kind of <u>Written Material</u>, <u>Arguments with the Invigilator</u> or <u>Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Paper(s)</u>.</li> </ul>		
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
1				
i	State any two examples of closed-loop systems.	2	CO2	K1
ii	List the standard test signals used in control systems.	2	CO1	K2
iii	Define transfer function.	2	CO2	K1
iv	Define poles and zeroes in control systems.	2	CO3	K2
v	Define rise time and peak time.	2	CO2	K1
vi	What is an order of a system?	2	CO3	K2
vii	What is the root locus?	2	CO4	K1
viii	State any one application of the root locus technique.	2	CO4	K2
ix	Define the Nyquist plot.	2	CO6	K1
x	What is a constant-N circle?	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	Sketch a block diagram of a closed-loop system and label its components.	05	CO1	K3
3	Discuss the analogy between mechanical and electrical systems.	05	CO2	K4
4	Derive the expression for settling time and steady state error.	05	CO3	K6
5	Explain how root locus helps in determining the stability of a control system.	05	CO6	K3
6	Describe the significance of the Nyquist stability criterion.	05	CO5	K3
7	Develop a mathematical model of an RLC parallel circuit.	05	CO4	K6

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

Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the difference between open-loop and closed-loop control systems.	10	CO3	K4
9	Determine the poles and zeroes of a system with transfer function: $G(s) = \frac{s+2}{s^2+4s+5}$	10	CO2	K5
10	Describe the time response of a second-order system.	10	CO5	K4
11	With the help of Routh's stability criterion find the stability of the systems represented by the characteristic equations: $s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$	10	CO3	K5
12	Discuss the effects of adding a pole to the open-loop transfer function on the Nyquist plot.	10	CO6	K3