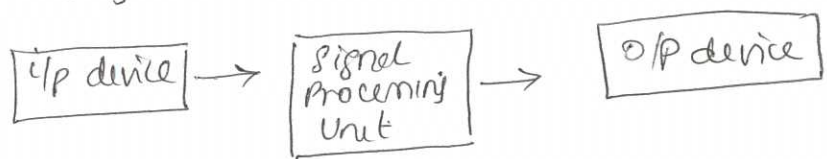
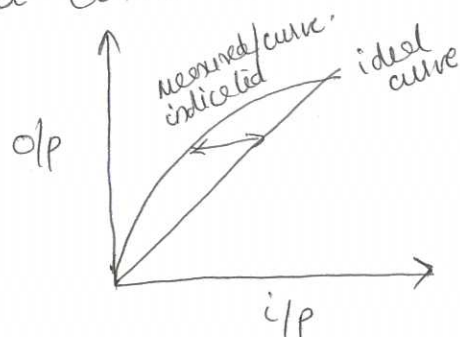


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13

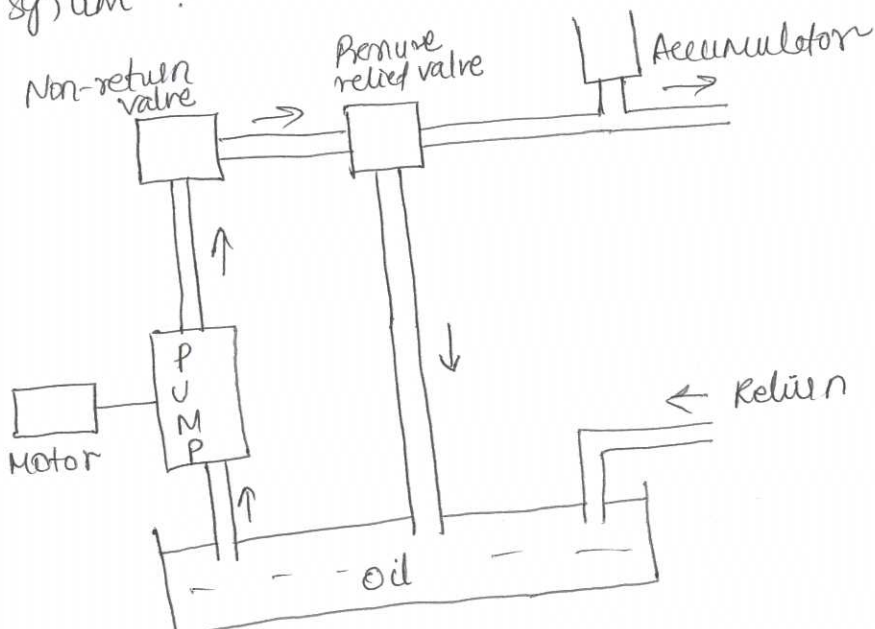
Version: ~~2015~~ (CA)

Qn. No.	Scoring Indicators	Split score	Total score														
01.1	Application of electronics & computers technology to control the motions of mechanical systems	Def-2	2														
1.2	Device converting one form of energy to other	Def-2	2														
1.3	Electromagnetism Principle	Principle 2 marks	2														
1.4	Moving data from one memory location to another Comparison of Magnitudes of data Arithmetic operations Data conversions.	Steps & Marks 2 Marks	2 2														
1.5	Definition																
2.1	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;"><u>Traditional</u></td> <td style="width: 50%; text-align: center;"><u>Mechanics</u></td> </tr> <tr> <td>a. Based on traditional system</td> <td>Based on ME, electronics, computer engs.</td> </tr> <tr> <td>b. Un flexible</td> <td>More flexible</td> </tr> <tr> <td>c. Un accurate</td> <td>More accurate</td> </tr> <tr> <td>d. More complicated mechanism</td> <td>Less complicated</td> </tr> <tr> <td>e. Manual control</td> <td>Automatic & Programmable control.</td> </tr> <tr> <td>f. More components & moving parts</td> <td>Less components & moving parts.</td> </tr> </table>	<u>Traditional</u>	<u>Mechanics</u>	a. Based on traditional system	Based on ME, electronics, computer engs.	b. Un flexible	More flexible	c. Un accurate	More accurate	d. More complicated mechanism	Less complicated	e. Manual control	Automatic & Programmable control.	f. More components & moving parts	Less components & moving parts.	6 Points 6 Marks	6
<u>Traditional</u>	<u>Mechanics</u>																
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Qn. No.	Scoring Indicators	Split score	Total score
2.2	<p>Disadvantages of automation</p> <p>a) Less versatility b) More Pollution c) Large initial investment d) unemployment e) unpredictable costs.</p>	Points 6 Marks	6 Marks
2.3	<p>Sensors & Transducers.</p> <p>Sensor - element producing signal related to Qty being measured</p> <div style="text-align: center;">  <pre> graph LR A[Input device] --> B[Signal Processing Unit] B --> C[Output device] </pre> </div> <p>Transducer - device converting primary form of energy into corresponding signal</p>	comparison 6 Marks	6 Marks
2.4	<p>Non linearity - max. deviation of actual measured curve of a sensor from ideal curve.</p> <div style="text-align: center;">  </div> <p>Stability - ability to give the same o/p when used to measure constant i/p over a period of time.</p>	2 concepts (3 Marks) = 6 Marks	6 Marks

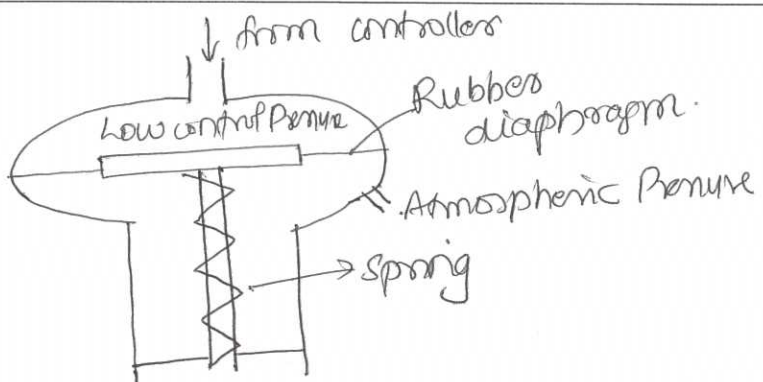
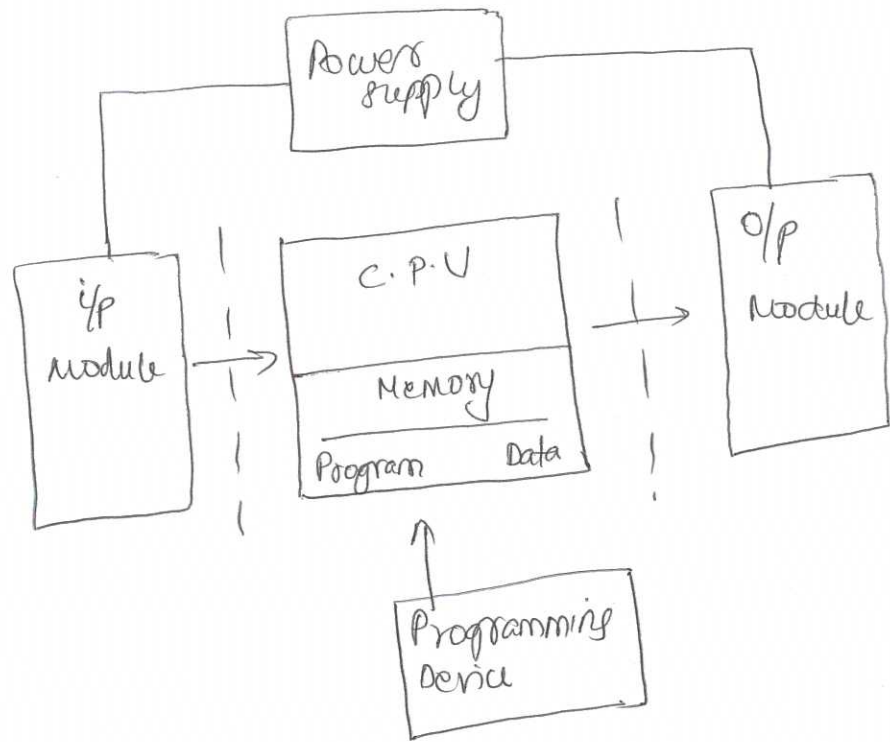
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Version: A

Qn. No.	Scoring Indicators	Split score	Total score
2.5	<p>Hydraulic Power Supply System .</p> <p>Designed to move loads by controlling high pressure fluid in distribution lines and piston with mechanical valves.</p> <p>Runs by pumping oil from sump through non return valve and accumulator to system .</p> 	<p>Fig-3 Description 3</p>	<p>6 Marks.</p>
2.6	<p>Principle</p> <p>Basis to move plug into flow pipe and alter cross section of pipe . cross section may be varied. Pneumatic actuator is used with Proportional control valves is diaphragm actuator .</p>		

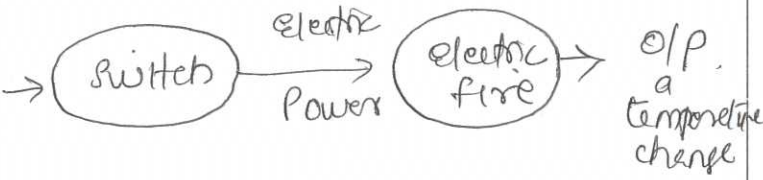
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Version: A

Qn. No.	Scoring Indicators	Split score	Total score
		<p>Fig + Principle 6 Marks</p>	<p>6 Marks</p>
<p>2.7.</p>	<p>structure of PLC.</p> 	<p>Structure 6 Marks</p>	<p>6 Marks</p>

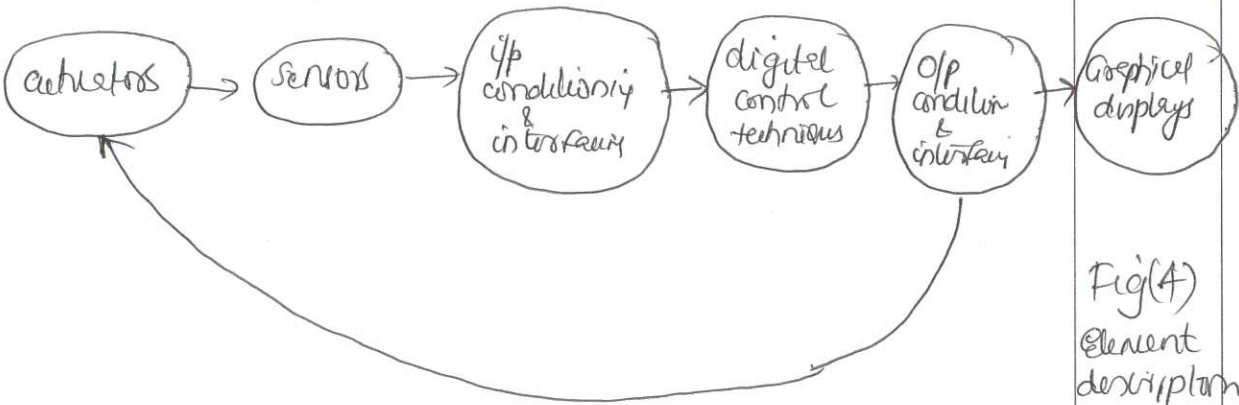
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Qn. No.	Scoring Indicators	Split score	Total score
3. a)	<p>Automation - use of various control system for operating equipments like machinery, Pumps in factories, boilers & heat treating furnaces</p> <p><u>advantages</u></p> <ol style="list-style-type: none"> Reduction in Production time Increase in accuracy & Repeatability Less human error Less employee costs Safety improved Higher volume of Production. 	<p>automation definition (2 Marks)</p> <p>Advantages (6 Marks)</p>	8 Marks
3. b)	<p><u>OPEN LOOP</u></p> <p>if decision to switch ON/OFF → </p> <p><u>Advantages</u></p> <ol style="list-style-type: none"> Simple Reliable Stable More suitable for accurate positioning Less costly. 		

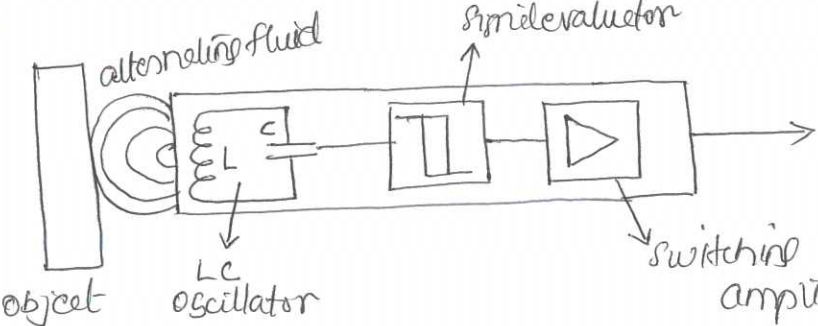
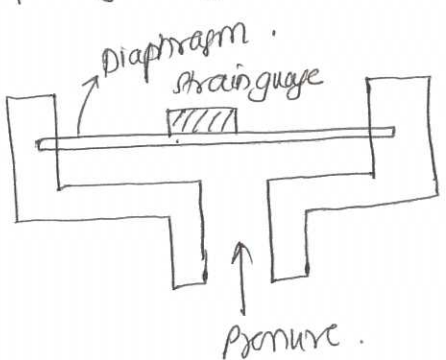
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Version: *A*

Qn. No.	Scoring Indicators	Split score	Total score
4.a)	<p>Basic elements .</p>  <pre> graph LR A(actuators) --> B(sensors) B --> C(I/P conditioning & interface) C --> D(digital control techniques) D --> E(O/P conditioning & interface) E --> F(Graphical displays) E --> A </pre>	<p>Fig(A) Element description (4)</p>	<p>8 Marks.</p>
4.b)	<p>Mechatronics.</p> <p><u>advantages.</u></p> <ol style="list-style-type: none"> Simplified design Rapid M/C setup Rapid development trials Adaptation possibilities Optimized performance Productivity Reliability Versatility. <p><u>disadvantages.</u></p> <ol style="list-style-type: none"> Increased power requirement Real time calculations / Mathematical model. 	<p>adv - 3 1/2 disadv - 3 1/2</p>	<p>7 Marks</p>

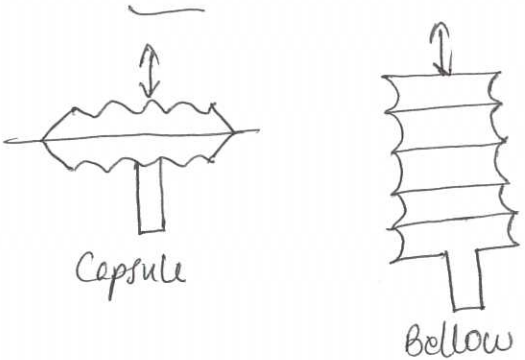
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Version: A

Qn. No.	Scoring Indicators	Split score	Total score
5.a)	 <p>there is coil, oscillator, detector, s/p circuit. Alternating current is supplied to coil, generates magnetic field.</p> <p><u>Applications</u></p> <ul style="list-style-type: none"> * Industrial automation - product counting * Security - metal object detection, arms, land mines. 	<p>Fig - 3Marks Exp - 3Marks applications - 2Mark</p>	<p>8 Marks.</p>
5.b)	<p>Diaphragm type:</p>  <p>Difference in pressure between two sides, centre becomes displaced.</p> <p>Movement is monitored by strain gauge.</p>	<p>Two types (3/2 x 2)</p>	<p>7Marks.</p>

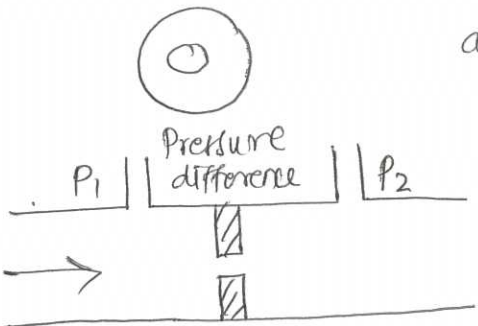
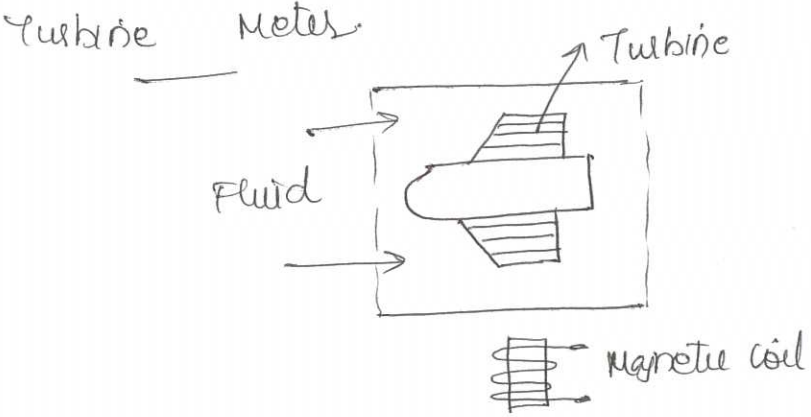
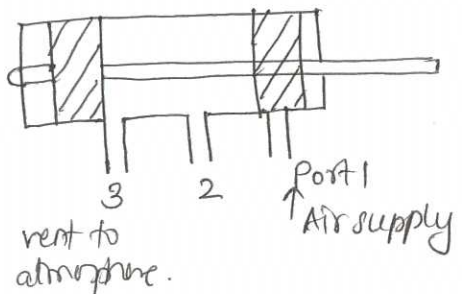
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Version: A

Qn. No.	Scoring Indicators	Split score	Total score
	<p>capsule & bellow type</p>  <p>capsules - corrugated diaphragms Stack of capsules called bellows.</p> <p>6.a) static characteristic of transducers.</p> <ul style="list-style-type: none"> * Range & span * Error * Accuracy * sensitivity * Hysteresis error * Non linearity * Reproducibility / repeatability * stability. * dead band * Resolution. 	<p>any 8 characteristics. 8x1</p>	<p>8 Marks.</p>

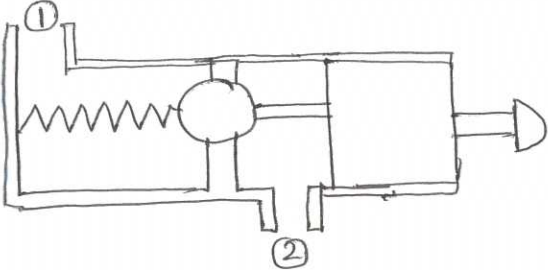
Code :

Version: *A*

Qn. No.	Scoring Indicators	Split score	Total score
6(b)	<p>Orifice plate - disc with hole at centre - fluid flow accuracy $\pm 1.5\%$.</p>  <p>Turbine Meter</p>  <p>Multi blade rotor centrally in pipe through which fluid flows. Fluid flow rotates the rotor.</p>	<p>3 1/2 x 2 7 Marks</p>	<p>7 Marks</p>
7(a)	<p><u>SPOOL VALVE</u></p>  <p>Spool moves horizontally, air supply to Port 1 device to Port 2. Port 3 closed.</p>		

Code :

Version: A

Qn. No.	Scoring Indicators	Split score	Total score
	<p>Poppet system</p>  <p>Port 1 connected to Pressure supply . Port 2 connected to system Ball is used. Push button depressed ball pushed out of its seat. Button released spring pushes back.</p>	<p>4 Marks X 2</p>	<p>8 Marks.</p>
<p>7(b)</p>	<p>Pneumatic system - air → motor → air compressor . air filtered primarily Pressure relief valve protects system To reduce temperature of air, intercooler is used .</p>	<p>Fig- 3 Marks description 4 Mark</p>	<p>7 Marks</p>
<p>8(a)</p>	<p>Pressure control valves description with sketches .</p>	<p>8 Mark</p>	<p>8 Marks .</p>

Code :

Version: A

Qn. No.	Scoring Indicators	Split score	Total score
9.a)	<p><u>Solution through 555 timer IC module</u></p> <p>ext resistors & capacitors are used to set the timing intervals in 555 timer.</p> <p>circuit triggered with i/p, o/p turned ON time duration being 1.1RC (Reference \rightarrow)</p> <p>C is capacitance in Farads.</p> <p>C (0.1 MF - 10 MF)</p> <p>Time delay less than 10 seconds.</p> <p>For more time delay, 555 timer replaced with 2N1034E timer.</p>	<p>description.</p> <p>8 Marks</p>	<p>8 Marks.</p>
9(b)	<p><u>Common hardware faults.</u></p> <p>a) sensors - Faulty</p> <p>b) switches & Relays - dusts & particles</p> <p>c) Motor - incorrect lubrication</p> <p>d) Hydraulic & Pneumatic systems - broken seals.</p> <p>e) Microprocessor systems - chip Failure, software faults.</p>	<p>Faults</p> <p>7 Marks.</p>	<p>7 Marks.</p>

Code :

Version: A

Qn. No.	Scoring Indicators	Split score	Total score
10 (a)	Microprocessor working with diagram	Diagram 4 Marks Working 4 Marks	8 Marks.
10 (b)	<u>Fault Finding techniques</u> a) Replication check b) expected value check c) timing check d) reversal check e) Parity & error coding check f) diagnostic check.	Techniques 7 Marks	7 Marks.