TOYOTA KIRLOSKAR MOTOR

Sample Test Project

Regional Skill Competitions – Level 3

Skill- Mechatronics

Category: Manufacturing & Engineering Technology

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Section - A

A. Preface

Skill Explained:

Mechatronics combines skills in mechanics, pneumatics, hydraulics, electronics, computer technology, and robotics and systems development. The computer technology element covers the programming of PLC's, robots and other handling systems and information technology applications, programmable machine control systems, and technology which enable communication between machines, equipment, and people.

Mechatronics technicians design, build, commission, maintains, repair, and adjust automated industrial equipment, and also program equipment control systems and human machine interfaces.

The more common and visible mechatronics appliances include shop tills (belt and cash register assemblies) and automated bottle machines.

Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):

Competitors born on or after 01 Jan 1994 are only eligible to attend the Competition.

Total Duration: Theory 4-5 hours, Practical -45mins

Section - B

B. Test Project and Marking Scheme

Unique ID Number :		Date:
Marks **Circuit writing** **/40**	**Practical** **/60**	**Total** **Sign** **/100**

TASK-1

Practical: 60 min Circuit writing: 60 min 10marks

1) Write the PLC circuit for the following condition
   When PB1 is pressed L1 gets ON after 10sec L1 off L2 ON there after 15 sec L2 OFF L3 ON, blinks with delay of 1sec for 10 times then gets OFF
   Parameter: PB3 press everything off.
   Cycle should repeat if PB1 press again after completion of one cycle.

Marking Scheme :- Task 1

Slno	Description	Marks	Score	Remarks
1	Standard symbols	1		
2	Circuit fulfilling all condition	1		
3	Ladder diagram	1		
4	Naming to contacts	1		
5	Addressing the contacts/coils	1		
6	Inputs at right side & output at left end	1		
7	Coils not connected in series	1		
8	Interlocking circuit	1		
9	Proper method of placing Emergency PB	1		
10	Mentioning the timing delay of the timer	1		
	TOTAL	10		

TASK-2

10marks

2) Write the PLC circuit for the following condition.
When PB1 is pressed feed unit advance & motor runs for 5 secs only if the job is present and clamped then return back.
After delay of 3 secs cycle repeats until PB4 is pressed.
Each operation can also be operated manually by individual push buttons
Parameter: PB3 press everything off.
Cycle should repeat if PB1 press again after completion of one cycle

Marking Scheme :- Task 2

Slno	Description	Marks	Score	Remarks
1	Standard symbols	1		
2	Circuit fulfilling all condition	1		
3	Ladder diagram	1		
4	Naming to contacts	1		
5	Addressing the contacts/coils	1		
6	Inputs at right side & output at left end	1		
7	Coils not connected in series	1		
8	Interlocking circuit	1		
9	Proper method of placing Emergency PB	1		
10	Mentioning the timing delay of the timer	1		
	TOTAL	10		

TASK-3

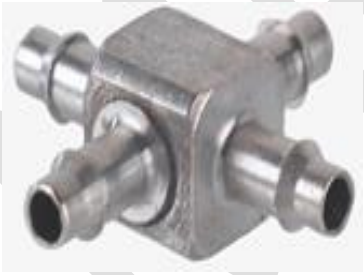
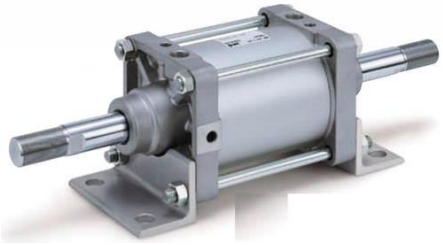
5 x 1 = 05 marks

3) Write the pneumatic symbols for the following
   a) Pressure limiting valve
   b) Pilot operated check valve
   c) Pressure sequence valve
   d) Vane type rotary actuators
   e) 5/3 way ABP connected, double solenoid & pilot operated manual override, spring centered

TASK-4

5x 1 = 05marks

4) Name the type of the fittings & cylinder

SL NO	IMAGE	NAME
1		
2		
3		
4		
5		

TASK-5

10marks

5) Write the Pneumatic circuit for the following

After pressing & releasing “Start” push button following sequence of operation should take place and it should continue.

By pressing & releasing another “Stop” push button that cycle should stop and no cylinder movement should take place

1. The double acting cylinder C1 comes forward with 5/2 double pilot operated DC valve. Forward stroke is defined by Limit switch LS2
2. After confirmation of C1 forward posn, Then Cyl C2 comes forward with 5/2 double pilot operated DC valve. Forward stroke is defined by Limit switch LS4
3. After delay of 5 sec Cyl C2 returns to Initial Posn which is sensed by Limit switch LS3
4. After confirmation of Cyl C2 initial posn & preset pressure is reached Cyl C1 retracts to initial posn which is sensed by Limit switch LS1.
5. When C1 returns to initial posn C3 comes forward with 3/2 spring offset single pilot DC valve sensed by Limit switch LS5.
6. Cyl C3 retracts to initial posn.
7. The speed of all the cylinders should be controlled

Marking Scheme :- Task 5

Slno	Description	Marks	Score	Remarks
1	Standard symbols	2		
2	Circuit fulfilling all condition	2		
3	Standard method of circuit writing	1		
4	Naming of components	2		
5	Naming of ports	2		
6	Mentioning the timing delay of the timer	1		
	TOTAL	10		

Unique ID number :	Date:

Subject: PLC Practical evaluation criteria **Practical: 20min**

A. Operation execution 10marks

Sl no	Operations	Marks	Score	Remarks
1	Manual unit advance with job sensor	1		
2	Manual motor forward rotation	0.5		
3	Manual camping	0.5		
4	Manual unit cycle	1		
5	Auto cycle	2.5		
6	2nd cycle execution & repetition	2		
7	PLC parameter setting	2		
8	Emergency stop condition	0.5		
	Total	10		

B. Station evaluation 10 marks

Sl no	Criteria	Description	Marks	Score	Remarks
1	Safety	Wears all safety wears while executing the practical (Cap, safety shoes)	1		
2		Wears gloves while operating CB & multimeter	1		
3		The contestant injured himself or others	1		
5		Keeping the CB/CP in off condition during connection	1		
6		At the end Press Emergency and s/off Main breaker	0.5		
7		Operates the CB by right hand only	1		
10	Tools & Equipment usage	Following the standard method of handling the tools	1		
11		No damage or drop of tools	0.5		
12		No damage of components	0.5		
14	Methodology	Proper routing of the wires	0.5		
17		Using the standard length of the wires	0.5		
18		Using proper colour of the wire	0.5		
19		Completes the exercise in given time	1		
		Total	10		

Evaluator	
Station referee	

Unique ID number :	Date:

Subject: Pneumatics Practical evaluation criteria **Practical: 20min**

A. Operation execution 10marks

Sl no	Operations	Marks	Score	Remarks
1	Cyl1 movement according to condition	1		
2	Cyl2 movement according to condition	1		
3	Cyl3 movement according to condition	1		
4	Circuit starts with PB1 & sequence	2		
5	Circuit starts with PB2	1		
6	Speed of the cylinder maintained	1		
7	Timing delay maintained	1		
8	Flow control valve usage	1		
9	Limit switch usage	1		
	Total	10		

B. Professional practice 10marks

Sl no	Criteria	Description	Marks	Score	Remarks
1	Safety	Wears all safety wears while executing the practical (Cap, safety shoes, goggle)	1		
2		The contestant injured himself/another person	1		
3		Keeping the shut off valve in off condition during connection	1		
4	Tools & Equipment usage	No fall /drop of component	1		
5	Methodology	Sets 2.5kgf pressure at FRL	1		
6		Proper routing of the hoses	1		
7		Following proper method of plugging & unplugging of the hoses	1		
8		Using the standard length of the hoses	1		
9		No leakage in the circuit	1		
10		Completes the exercise in given time	1		
		Total	10		

Evaluator	
Station referee	

Unique ID number :	Date:

Subject: Wring trouble shooting Practical evaluation criteria **Practical: 20min**

A. Operations 10marks

Sl no	Operations	Marks	Score	Remarks
1	PB1 operation on SS ON	2		
2	PB2 operation on SS OFF	2		
3	L1/L2 ON according to condition	1		
4	2nd cycle execution	1.5		
5	Emergency stop condition	1.5		
6	Timing delay according to condition	1		
7	Selector switch interlock	1		
	TOTAL	10		

B. Professional practice 10marks

Sl no	Criteria	Description	Marks	Score	Remarks
1	Safety	Wears all safety wears while executing the practical (Cap, safety shoes)	0.5		
2		Wears gloves while operating CB & multimeter	0.5		
3		The contestant injured himself & others	0.5		
5		Keeping the CB/CP in off condition during connection	0.5		
6		At the end Press Emergency and s/off Main breaker	0.5		
7		Operates the CB by right hand only	0.5		
8		NO Short circuit	0.5		
9	Tools & Equipment usage	Switching off the multimeter after use	0.5		
10		Following the standard method of handling the tools	1		
11		No damage of tools or drop	0.5		
12		No damage of components	0.5		
13	Methodology	Proper routing of the wires	0.5		
14		Following proper method lugging of the wires	1.5		
15		Using the standard length of the wires	0.5		
16		Using proper colour of the wire	0.5		
17		Completes the exercise in given time	1		
		TOTAL	10		

Evaluator	
Station referee	

Section – C

E. Instructions for candidates

- Competitors have to complete writing circuit within the time of first session
- Competitors have to connect the same circuit has written by them in answer paper, change in circuit with lead for reduction in points
- During practical session change in the written circuit is not allowed
- Time will be allocated to check the working condition of the component, declaration on not working condition should be done that time
- The working methodologies are considered for marking
- Any damage in the component will not be replaced if declared after starting of the competition
- Competitors can check for the working of the circuit any number of time before declaration
- If found short circuit in the circuit during evaluation, the evaluation will be stopped.

Section – D

F. Health, Safety, and Environment

1. All accredited participants, and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.
2. All participants, technicians and supporting staff will wear the required protective Personnel clothing.
3. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage, however in case of Injury the competitor will immediately inform the immediate organizer for medical attention.