

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: Theory of Automation
Program: B.Tech Mechatronics
Course Code: MECH4003

Semester: VIII
Time: 03 hrs.
Max. Marks: 100

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	List the reason for automation.	5	CO1
Q 2	Classify different types of manufacturing industries.	5	CO1
Q 3	List the different level of automation system.	5	CO2
Q 4	Classify different types of vehicle used in material transport system.	5	CO2
Q5	Define the supervisory control system.	5	CO3
Q6	List the basic elements of automation system.	5	CO3

SECTION B

Q 1	Describe the ten principles of material handling.	10	CO2
Q 2	A unit load AS/RS is being designed to store 1000 pallet loads in a distribution center located next to the factory. Pallet dimensions are; $x = 1000$ mm, $y = 1200$ mm, and the maximum height of a unit load = 1300mm. The following is specified (1) The AS/RS will consists of two aisles with one S/R machine per aisle.(2) length of the structure should be approximately five time its height (3) the rack structure will be built 500 mm above floor level. Using the allowances $a=150$ mm, $b=200$ mm, $c=250$ mm, determine the width, height and length of AS/RS structure.	10	CO3
Q3	Explain the vehicle guidance technology used in the material transport system.	10	CO4
Q 4	Describe the different types of considerations in material handling system design.	10	CO4
Q5	Explain the control requirement in automation industries.	10	CO3

SECTION-C

Q1	The length of the storage aisle in an AS/RS = 240 ft and Its height = 60 ft. Suppose horizontal and vertical speeds of the SIR machine are 300 ft/min and 60 ft/min, respectively. The S/R machine requires 18 sec to accomplish a pick-and-deposit operation.	20	CO4
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Find: (a) the single command and dual command cycle times per aisle and (h) throughput for the aisle under the assumptions, that storage system utilization = 85%: and the numbers of single command and dual command cycles are equal.

OR

An AS/RS with four aisles is 80 m long and 18 m high. The S/R machine has a maximum speed of 1.6 m/sec in the horizontal direction. It accelerates from 0 to 1.6 m/sec in a distance of 2.0 m, On approaching its target position (where the S/R machine will transfer a load on to or off of its platform), it decelerates from 1.6 m/sec to a full stop in 2.0 m. The maximum vertical speed is 0.5 m/sec. and the acceleration and deceleration distances are each 0.3 m. Rates of acceleration and deceleration are constant in both directions. Pick-and-deposit time = 12 sec. Utilization of the AS/RS is assumed to be 90% and the number of dual command cycles equal; the number of single command cycles. (a) Calculate the single command and dual command cycle times including consideration for acceleration and deceleration. (b) Determine the throughput rate for the system