MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH (ELECTRONICS AND INSTRUMENTATION)
END SEMESTER EXAMINATIONS, DEC 2020 / JAN 2021
### CONTROL SYSTEM COMPONENTS [ICE 3151]

Marks: 50   **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates:
Missing data may be suitably assumed

1) A)	Draw the closed loop schematic of a servo motor used for position measurement with potentiometer as a feedback element and explain its working.	(4)
B)	Consider a TX-TR synchro system with supply voltage of 230V AC and stator to rotor winding ratio of 1:2.5. Determine the stator voltages with respect to the common stator connection and also between the stator windings if TX is rotated 40° Clockwise. The initial orientation is towards S_1.	(4)
C)	A motor running at 400 rpm drives a paper roller in a printer. The gear on the motor has 40 teeth, and the gear on the roller has 100 teeth. Determine the speed of the roller.	(2)
2) A)	Explain the working of a variable reluctance stepper motor with neat sketch.	(3)
B)	A stepper motor has the following properties: Holding torque: 50 in. oz Dynamic torque: 30 in. oz Detent torque: 5 in. oz The stepper motor will be used to rotate a 1-in. diameter printer platen. The force required to pull the paper through the printer is estimated to not exceed 40 oz. The static weight of the paper on the platen (when the printer is off) is 12 oz. Will this stepper motor do the job?	(4)
C)	Explain the working of a double acting cylinder drive shown in figure illustrating the position of the cyclinder for all the possible combinations of solenoid valve actuation.	(3)

3)
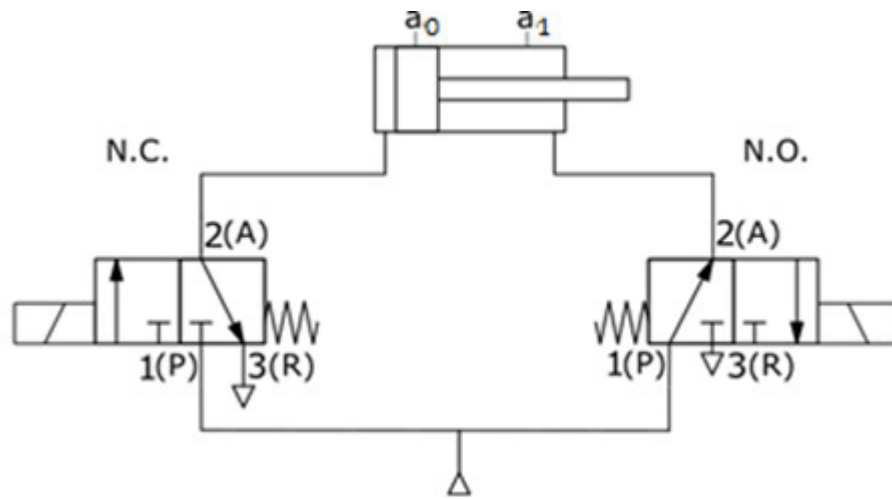
A)   The maximum flow rate through an equal percentage control valve is 20 m^3/hr. If the valve has a turndown ratio of 40:1, estimate the flow rate at 60%, 70% and 80% respectively. (3)

B)   Define and illustrate the following terms with respect to cams and followers.
1. Prime circle
2. Pitch circle
3. Pitch point (3)

C)   Draw the pressure and velocity profile of a control valve and explain the effect of chocked flow. Also discuss the methods to avoid cavitation and flashing. (4)

4)   Describe the working of Electronic valve positioner with the help of a neat diagram. (4)

A)

B)   With the help of diagrams, illustrate the following terms with respect to gears.
1. Circular pitch 2. Pitch circle 3. Diametral pitch (4)

C)   Find the flow rate of a valve with valve pressure drop of 10ft and flow coefficient of 51. (2)

5)   Explain the working of Non-Bleed Relay type pneumatic controllers with neat diagram. (3)

A)

B)   Describe the construction and working of Swash plate piston pump. (3)

C)   Derive an expression for gyroscopic acceleration. (4)

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