Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, NOVEMBER - 2019

SUBJECT: CONTROL SYSTEM COMPONENTS [ICE 3105]

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A. Explain the working of resolver with necessary waveforms and schematic diagram.

1B. With the help of timing diagram explain how a servomotor is controlled using PWM.

1C. The voltage applied to the rotor of a synchro transmitter is 52V rms. The rotor shaft is moved 30° from the zero position towards clockwise direction. Determine the stator voltages w.r.t. the common stator connection for k=1.5. Also determine the voltages between terminals S_1 and S_2, S_2 and S_3 and S_3 and S_1. Take S_1 as the reference winding.

(3+3+4)

2A. Explain the working of a variable reluctance type stepper motor with a figure.

2B. A 3.6° stepper motor turns a leadscrew that has 24 threads per inch.

a. How many steps will it take to advance the leadscrew 1.25 in.?

b. What is the linear distance the leadscrew advances for each step?

2C. Draw the P&I diagram of a CSTR system that operates in cascade control mode, uses steam inflow as inner loop and temperature of the tank as outer loop. Make necessary assumptions and justify.

(3+2+5)

3A. For a double acting cylinder drive as shown in Fig. Q3A, explain the working and position of the cylinder for all the possible combinations of solenoid valve actuation.

3B. With a figure, explain the working of a three-port mixer and diverter valve.

3C. Discuss the characteristics of control valve with respect to the size of seat and plug.

(4+3+3)

4A. Draw the sketch of a pilot bleed type two-position relay controller and explain its working in detail.

4B. Discuss any four terms used in cams and follower with necessary figure.

4C. Explain the working of unbalance vane pump with illustration.

(3+4+3)

5A. Explain the construction and working of an internal gear pump.

5B. Explain the basic construction and working of a gyroscope.

5C. Derive the expression for total angular acceleration of a disc in a gyroscope with necessary vector diagrams.

(3+2+5)

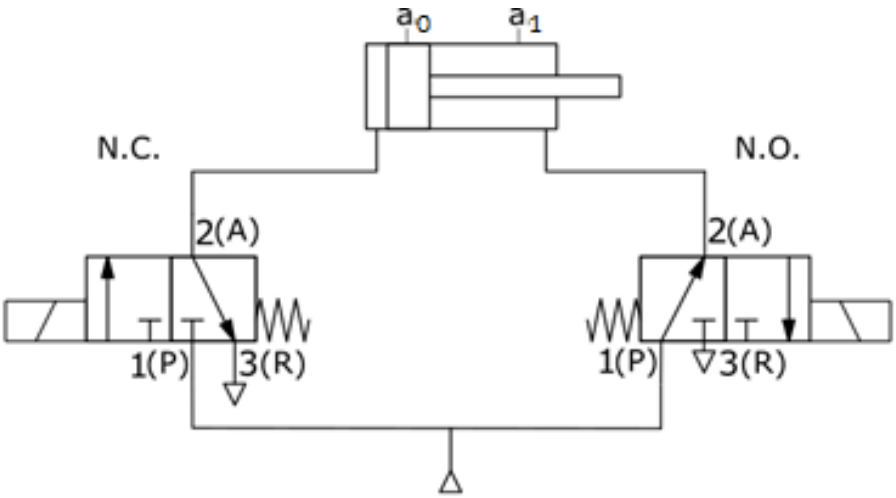

Fig.Q3A

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