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

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH. (ELECTRONICS & INSTRUMENTATION ENGG.)

END SEMESTER DEGREE EXAMINATIONS, JANUARY - 2021

SUBJECT: CONTROL SYSTEM COMPONENTS [ICE 3151]

TIME: 3 HOURS 30-01-2021 MAX. MARKS: 50

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

1A. Explain the working of field controlled DC servo motor.

1B. Draw the schematic of a resolver and explain its working.

1C. Obtain the transfer function of a DC servomotor with the following parameters:

Parameters	Value	Parameters	Value
Ra	2.6 Ω	Kb	7.67E-3 V/(r/s)
La	180 µH	Je	5.3E-7 kg*m2
Kt	7.67E-3 N*m/A	De	7.7E-6 N*m/(r/s)

1D. Write a note on tachogenerators

(2+3+3+2)

2A. Draw all the schematic symbols used in synchros.

2B. For the circuit diagram give in Fig 2B, calculate the receiver stator voltages with respect to common terminal and also between the stator terminals.

2C. Explain the working of a variable reluctance stepper motor with neat sketch.

(2+4+4)

3A. Describe the modes of operation of stepper motor.

3B. Determine the uncontrollable flow rate through a 6 in. globe valve where C_v equals 350 and rangeability equals 10.4:1. Assume the full flow (wide open) differential pressure across the valve equals 5 psig.

3C. Explain the working of Bleed type pneumatic controllers with neat diagram.

(4+3+3)

4A. A hydraulic cylinder to be used to move a work piece in a manufacturing operation through a distance of 250 mm in 15 s. If a force of 50 KN is required to move the work piece, what is the required working pressure and hydraulic liquid flow rate if a cylinder with a piston diameter of 150 mm is available?

4B. For a CSTR shown in Fig 4B, develop a Temperature + Level cascade control loop and draw the P&I diagram. Make proper assumptions as required.

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

(3+4+3)

5A. Define the following terms, with respect to cams and followers, with illustration.

a. Base circle
b. Trace Point
c. Pitch Curve

5B. Draw the sketch of any two type of gear pumps and describe their construction and working.

5C. What do you understand from Gyroscopic couple? Explain with necessary figure.

(3+4+3)

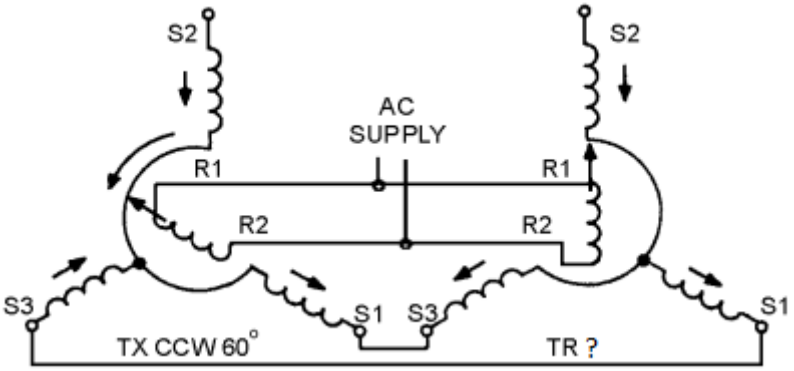

Fig 2B

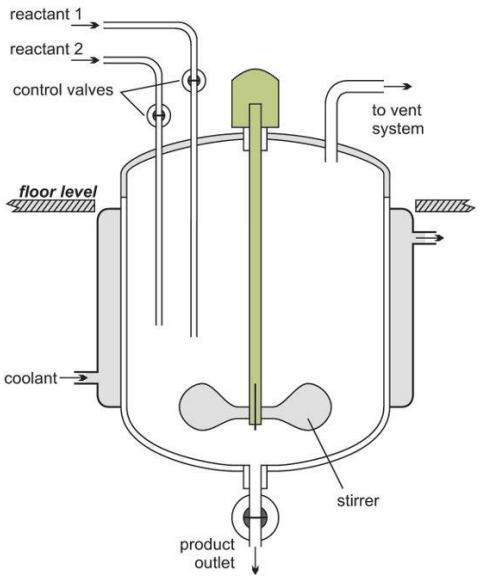

Fig 4B

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