Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, NOV - 2017

SUBJECT: CONTROL SYSTEM COMPONENTS [ICE 3105]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. Draw the schematic of a field controlled DC servo motor and explain its working. What do you understand from knee point? Compare knee point of a field controlled DC servo motor with an armature controlled DC servo motor. **4**

1B. Calculate the transfer function of a DC servomotor with the following parameters. **2**

Parameters	Value
R_a	2.8 Ω
L_a	150 µH
K_t	7 E-3 N*m/A
K_b	7 E-3 V/(r/s)
J_e	5.3 E-7 kg*m2
D_e	7.7E-6 N*m/(r/s)

1C. Draw the torque speed characteristics of a DC servomotor and explain the effect of increase or decrease in coil resistance values. **4**

2A. For the figure given in Q2A, calculate the final position of TR and individual stator voltages of TX, TDX, and TR, when TX rotor is at 60° CW and TDX rotor is at 90°CCW. **4**

2B. What is zeroing of synchros? Explain all the methods with necessary figures **4**

2C. For a typical single-step stepper motor with a step rate of 9 steps / second and 10°/step, calculate the rpm after 100 seconds. **2**

3A. Draw a level control system with control valve as actuator and explain about the loop gain. **3**

3B. Differentiate installed characteristics with inherent characteristics of a control valve with necessary graphs. **3**

3C. Write a note on cavitation and flashing. Also discuss the methods used to eliminate cavitation. **4**

4A. Justify the necessity of valve positioners. Also specify when they cannot be used. **3**

4B. List all the types of cam and followers and explain its working in short. **4**

4C. Explain the working of a pilot bleed type proportional relay controller. **3**

5A. Explain the working of a Gerotor pump with neat sketch. **3**

5B. Find the overall gear ratio of the gear train given in Fig. Q5B **2**

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

necessary vector diagrams.

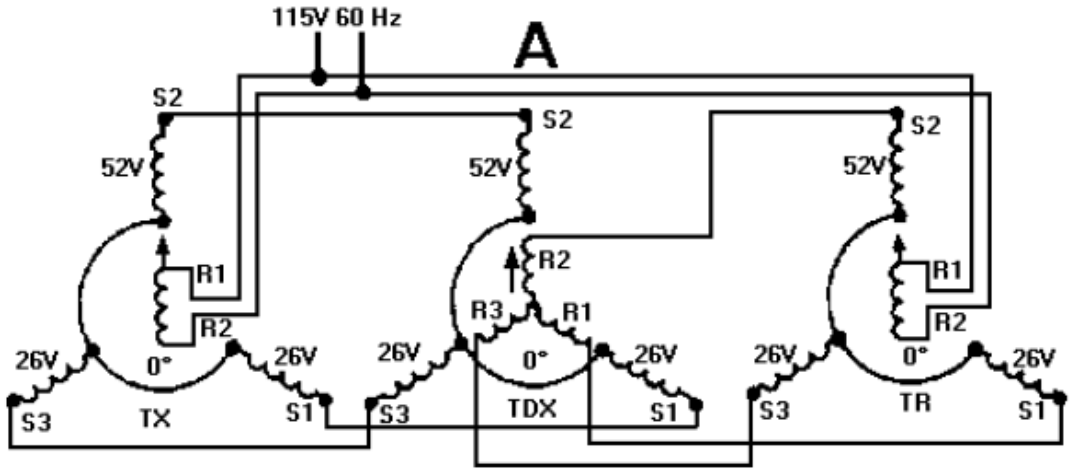

Fig Q2A

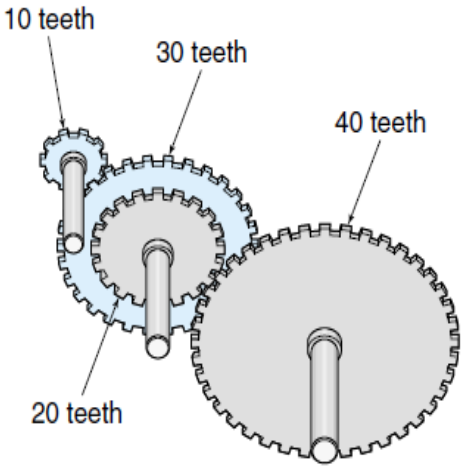

Fig Q5B

****