Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM- III (BM&I) CBCS (NEW) REGULAR EXAMINATION– NOV-DEC 2015

2BM303: Medical System Actuators

TIME: 3 HRS **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 Answer the following questions: (10)

a) A stepper motor has a step angle of 1.8 degree and is driven at 4000 pulse per second. Determine i) Resolution ii) Motor speed iii) Number of pulses required to rotate through 72 degree. (04)

b) Explain the working of 1-phase ON mode, 2-phase ON mode and half stepping operation of the stepper motor with neat sketches. (06)

OR

Q.1 Answer the following questions: (10)

a) What is the required resolution for a stepper motor that is to operate at a pulse frequency of 6000 pulse per second and a travel 180 degree in 0.025 second? (04)

b) Enlist the different types of stepper motor and make the comparison between them. (04)

c) What is micro-stepping? (02)

Q.2 Answer the following questions: (10)

a) Define "RELAY". Which type of relay is used to convert electrical energy into mechanical movement? Explain in detail with neat sketches. (06)

b) What are the principle reasons for employing relay circuit? (02)

c) Which type of material is used to make relay circuit? (02)

OR

Q.2 Answer the following questions: (10)

a) Draw and Explain the structural arrangement of dry reed relay and mercury wetted reed relay. (06)

b) Draw the following relay circuit and explain their operation: (04)
i) Series Circuit ii) Double Detector Circuit

Q.3 Answer the following questions: (10)

a) Define "Actuator". Enlist different types of actuators. How actuators are used as energy controller and energy converter? (06)

b) Mention whether the following statements are True or False and Justify each. (04)
i) Mercury reed relay must mount vertically.
ii) Solid State Relay has a highest wear and tear rate.
iii) In electromechanical relay, spring is used as a heat sink.

SECTION: II

Q.4 (10)

a) Enlist the components used to make hydraulic system. Draw the component arrangement of it and explain in detail. (05)

b) Draw linear spring – diaphragm actuator having fixed plug orientation. Explain its working. (05)

OR

Q.4 (10)

a) How flapper nozzle mechanism is used in Electro-pneumatic actuator. What is the standard range of current and pressure signal? (05)

b) Draw the schematic arrangement of: i) Sliding gate valve ii) Poppet valve (04)

c) What is the meaning of NRV? (01)

Q.5 (10)

a) Explain the principle of operation of a single phase transformer and derive its EMF equation. (05)

b) How the servo motor is differ than other industrial motors? Explain AC servomotor along with speed torque characteristics. (05)

OR

Q.5 (10)

a) A 10 KVA single phase transformer has primary voltage 2.5 KV and turns ratio N2 : N1 = 1 : 10. Calculate: i) Full load secondary current, ii) the value of load resistance to be connected across secondary for full load KVA operation, iii) the primary full load current. Assume losses are negligible. (05)

b) What is the principle of HALL effect? Explain magnetostrictive actuator. (05)

Q.6 (10)

a) What is the use of solenoid valve? Draw the component arrangement of it and explain in detail. (05)

b) Compare hydraulic and pneumatic system. (05)

----------END OF PAPER----------