

Exam.Code:0944
Sub. Code: 7079

1058

B.E. (Mechanical Engineering)
Eighth Semester
MEC-801: Mechatronics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- a) Explain the difference between open- and closed-loop controls.
- b) Explain what is meant by sequential control and illustrate your answer by an example.
- c) Suggest a display unit that could be used to give a permanent record of the output from a thermocouple
- d) A d.c. motor is required to have a torque which is almost constant regardless of speed. Suggest suitable forms of motor.
- e) Explain the principle of a pilot-operated valve. (5x2)

UNIT - I

- II. An actuator has a stem movement which at full travel is 40 mm. It is mounted on a process control valve with an equal percentage plug and which has a minimum flow rate of $0.2 \text{ m}^3/\text{s}$ and a maximum flow rate of $4 \text{ m}^3/\text{s}$. What will be the flow rate when the stem movement is (a) 10 mm, (b) 20 mm? (10)
- III. Devise a system, using a PLC, which can be used to control the movement of a piston in a cylinder using a 4/2 solenoid-operated pilot valve, so that when a switch is momentarily pressed, the piston moves in one direction and when a second switch is momentarily pressed, the piston moves in the other direction. (10)
- IV. A two-position mode controller switches on a room heater when the temperature falls to 20°C and off when it reaches 24°C . When the heater is on, the air in the room increases in temperature at the rate of 0.5°C per minute; when the heater is off, it cools at 0.2°C per minute. If the time lags in the control system are negligible, what will be the times taken for (a) the heater switching on to off, (b) the heater switching off to on? (10)

P.T.O.

(2)

UNIT - II

- V. Explain, for a microprocessor, the roles of (a) accumulator, (b) status, (c) memory address. (d) program counter registers. (10)
- VI. Explain in detail the memory-mapped system for inputs/outputs. (10)
- VII. Explain the application of mechatronics to observe and control a Tick and Place Robot. (10)

x-x-x