

- N.B.** (1) Question No. 1 is **compulsory**.
(2) Solve any **four** out of remaining **six** questions.
(3) Assume suitable data wherever **required** with justification.
(4) Draw neat **circuit** and/or block **diagram** to support your answers.

1. Solve any **four** :-

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| (a) | Explain process equation, process load, process lag self regulation and control lag with suitable example. | 5 |
| (b) | Compare pLC, SCADA and fuzzy controller | 5 |
| (c) | Explain pH measurement with diagram. | 5 |
| (d) | Describe the manufacturing process for "making paper" | 5 |
| (e) | Explain brief the construction and principle of operation of strain gauge. | 5 |
| 2. | (a) Define Reynold number, what is Bernoulli's equation, explain venturimeter for flow measurement, also write flowrate equation of it. | 10 |
| | (b) Explain any one process along with control diagram in the food industry. | 10 |
| 3. | (a) A process is to operate under PID with a 60% PB. 1.2 min. integration time and 0.05 min derivative time. If the error is available as percent of span, develop the control equations and show a flow chart of computer controller action with all constants evaluated. The sample time is 0.8 mins. | 10 |
| | (b) Explain in detail tuning of pneumatic PID controller. | 10 |
| 4. | (a) Explain distillation of hydro carbons in the petroleum industry. | 10 |
| | (b) Explain ratio control, cascade control, feed forward control, duplex control, with one example of each mode of control in process instrumentation. | 10 |
| 5. | (a) Describe a typical SCADA system used in moderately large instrumentation set-up with a specific example. | 10 |
| | (b) Compare RTD and thermistors for temperature measurement. Also write their equations relating resistance and temperatures. What do you mean by thermocouple tables ? | 10 |
| 6. | (a) Describe self tuning regulator with block diagram and compare its operation with Model reference adaptive control (MRAC). | 10 |
| | (b) Explain low, moderate and high pressure measurement. Also for a McLeod gauge has volume of bulb, capillary and tube down to its opening equal to 90 cm^3 and a capillary diameter of 1 mm. Calculate the pressure indicate by a reading of 3 cm. | 10 |
| 7. | Write short notes on the following (any four) :- | 20 |
| | (a) H-Infinity design procedure | |
| | (b) Control valves | |
| | (c) Dyeing of fabric | |
| | (d) Instrumentation Amplifier | |
| | (e) Carbonation control system in breweries | |
| | (f) Actuators and pumps. | |