B.E.(INSTRUMENTATION)(SEM VIII) (CBSGS) DEC.2019/13.12.2019

Time: 3 Hours **Total Marks: 80**

Note:

1. **Question No.1 is compulsory**
2. **Solve any THREE questions out of remaining FIVE questions.**
3. **Figure to the right indicate full marks.**
4. **Assume suitable data if required.**

Q 1 State true/False and hence justify the following:

a) Absolute method of calibration is the most accurate method. **(04)**

b) The value of expansion factor is 0.667 at chocked flow condition. **(04)**

c) Two valves connected in series helps to reduce cavitation. **(04)**

d) Ergonomics deals with man-machine interaction, man-workspace interaction and man-environment interaction **(04)**

e) Redundancy across a weaker equipment results in higher reliability as compared to redundancy across the stronger equipment. **(04)**

Q 2 a) Explain in detail the design phase and engineering phase in any electronic product design. **(10)**

b) Size the control valve for the following conditions: **(10)**

Fluid: Water Flow rate: 1600gpm

Upstream pressure: 27.9psig Downstream pressure : 34.7psia

Pipe diameter: 8inches Sch. 40

Valve style: 60^0 Butterfly valve C_d : 17

Q 3 a) Natural gas in a 10" schedule 40 pipe flowing at a rate of 1200000 scfh is reduced in pressure from 15psig to 10inches of water column. The specific gravity is 0.6, Molecular weight = 29, Temperature is 40^0F, k= 1.26. The valve selected is Butterfly valve with Cd=17, X_T = 0.38. At given pressure and temperature Z = 1. Find size of the valve and Mach number for the suggested design. **(10)**

b) Explain Control Room Design Criteria. **(10)**

Q. 4 a) Draw and explain the power wiring and distribution for control panel. **(10)**

b) **(10)**

Design an Actuator for following application:
Valve size = 2" , Type = Cage guided Globe ,
Flow direction = Flow to Open(FTO), Failure action =Fail open(FO)
Packing Teflon V-rings, travel = 1.125 inch,
Seat Diameter = $2\frac{5}{16}$ inch , Plug diameter: ½ inch,
Stem Diameter = ½ inch , K_h Open = - 0.16 , K_h Close = -1.00 ,
Air Pressure = 3-15 psig, Diaphragm area 69 sq.inch ,
Fluid pressure Open = 40-25psig, Fluid pressure Close = 50-10 psig
spring rate available: 275/370/ 460lb/hr .
If spring rate is not suitable, find proper correction to make it suitable.

Q. 5 a) Discuss Sources of valve noise sources with abatement techniques. **(10)**

b) Enclosure design guidelines of electronic product. **(10)**

Q. 6 Write short notes on- **(any two)**

a) Bath tub curve with its significance. **(10)**

b) Thermocouple installation **(10)**

c) X, Y, Z purging of control panels **(10)**

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