GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

(An Autonomous Institute of Government of Maharashtra)

National Highway No.6, JALGAON – 425 002

Phone No.: 0257-2281522   Fax No.: 0257-2281319
Website : www.gcoej.ac.in   E-mail : princoej@redifmail.com

Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **IN451 - Instrumentation System Design**

Generated At : **19-04-2022 15:16:22**

Maximum Marks : **60**   Duration : **3 Hrs**

[Edit] [Print] [View Answer Key] [Close] **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. *All questions are compulsory.*
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1)   Solve the following questions

a)   Define sensitivity drift and zero drift. What factors can cause sensitivity drift and zero drift in instrument characteristics?   [6]
A tungsten/5% rhenium–tungsten/26% rhenium thermocouple has an output e.m.f. as shown in the following table when its hot (measuring) junction is at the temperatures shown. Determine the sensitivity of measurement for the thermocouple in mV /°C.

mV	4.37	8.74	13.11	17.48
°C	250	500	750	1000

b)   The following circuit is design circuit of Temperature control system by using the thermistor .Identify the input ,control and output stages and its working in this design   [6]
circuit.
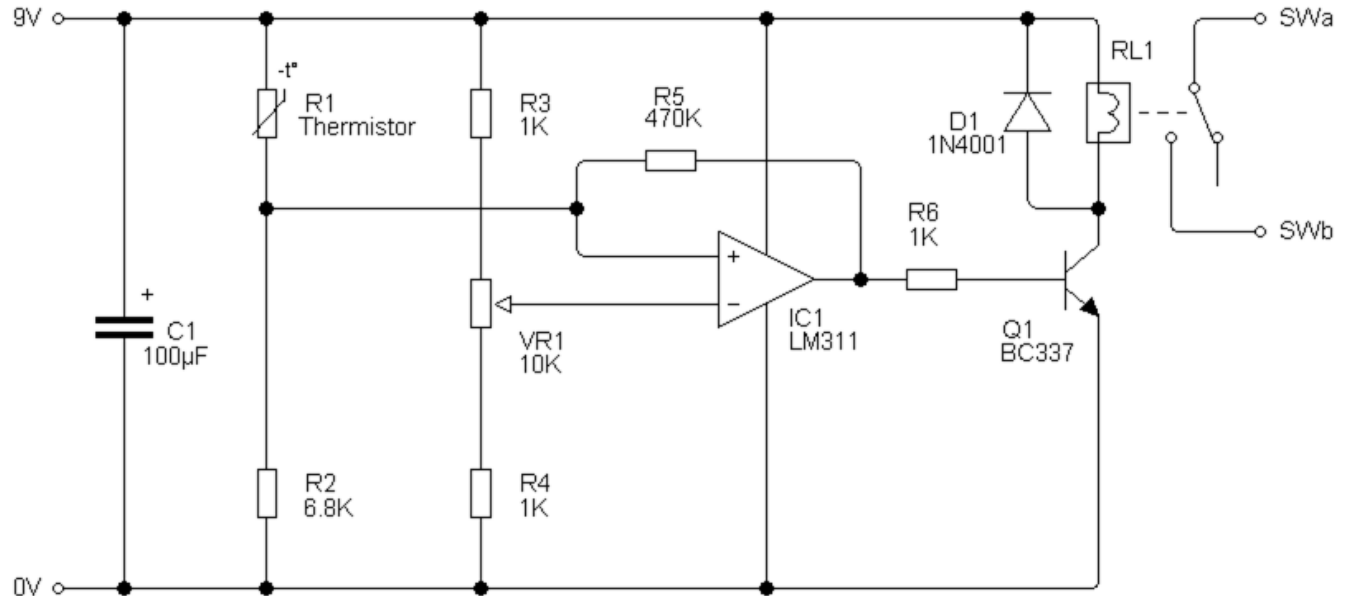
2)   Solve any two of the following circuit

a)   What factors govern the transmission speed and directionality of ultrasonic waves?How do these factors affect the application of ultrasonic sensors?   [6]

b)   Design a level measurement system in closed tank by using the DP Transmitter (Differential pressure cell).Show the tappings and working principle for level   [6]
measurement

c)   Differentiate between Variable area and Variable Head flow meters .Define the procedure for designing the float in the variable area flow meter   [6]

3)   Solve any two of the following circuit

a) The failure rate typically changes with time in the manner as shown in the diagram .Identify the failure rate curve for electronic and Mechanical components from these curves and explain [6]
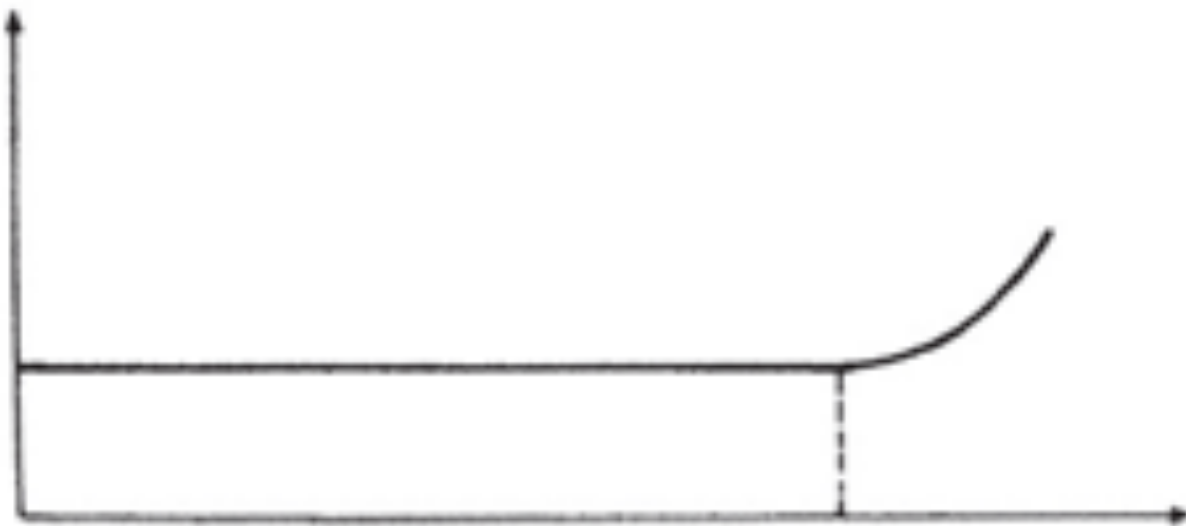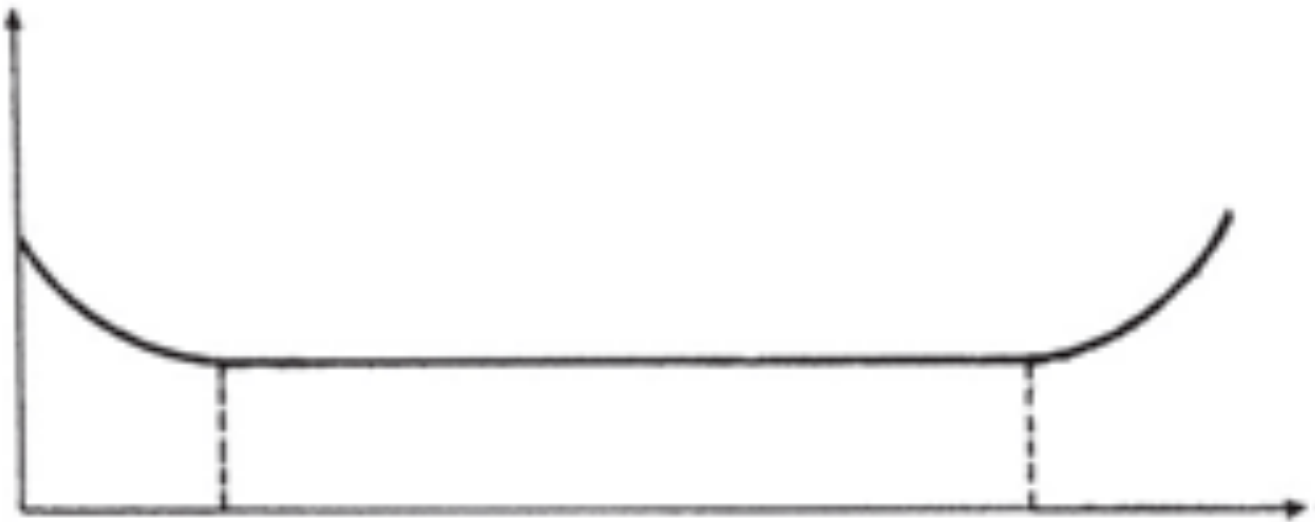
Bath Tub curve

b) Define the equations and Explain the rules for calculating the overall reliability of system components that are connected (a) in series with each other and (b) in parallel with each another [6]

c) 1. The performance of a measuring instrument is monitored over a 1-year (365-day) period, and intervals between faults being recorded are as follows: [3]
27 6 18 41 54 29 46 14 49 38 17 26 Calculate the mean time between failures MTBF

2. In an example, suppose that the time in hours taken to repair an instrument over a history of 18 breakdowns is recorded, with the following times:Find MTTR [3]
4 1 3 2 1 9 5 1 4 7 7 4 2 3 2 5 9 3

4) Solve any two of the following questions

a) Design a Electronic proportional mode controller by using Op amp .Derive the the analog electronic equation for the output voltage [6]

b) A temperature controller controls temperature from 100° to 200°C. A sensor provides an output of 2 to 10 V for this temperature range. The controller output drives a heater with an output of 0 to 7 volts. What circuit gain is needed if the controller is to be used with a proportional gain of 4%/%?Calculate using the proportional band also [6]

c) Draw a pneumatic propotional integral controller using flapper nozzle mechanism and bellows .Explain how it works as propotional integral controller [6]

5) Write a short notes on

1. Grounding and shielding techniques [6]
2. Control panel layout ergonomics [6]

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