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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

A Constituent Institution of Manipal University

FIRST SEMESTER M.TECH (CONTROL SYSTEMS)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: SYSTEM MODELING AND IDENTIFICATION [ICE 5123]

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.
- ❖ Draw the sketches wherever necessary.

- 1A. List the essentials of system identification. 2
- 1B. Distinguish quantitative and qualitative models. 3
- 1C. With a neat sketch on system identification brief (i) Data generation and acquisition (ii) Data pre-processing. 5
- 2A. What are the classifications of models ? 2
- 2B. Explain parametric and non-parametric models with necessary equations. 3
- 2C. How to estimate the parameters of the MIMO system using least square algorithm. Also write its advantages over other methods. 5
- 3A. Brief Moving Average (MA) filter. 2
- 3B. Write a short note on ARX modeling. 3
- 3C. Explain the generation of PRBS signal with a truth table. Also write how PRBS is used for process identification. 5
- 4A. Define normal distribution along with its expression. 2
- 4B. Using Taylor's series linearize the multistate model and obtain the system model. 3
- 4C. Derive for the Gamma Distribution factor. Also draw the gamma probability density function. 5
- 5A. Define (i) Variance (ii) Mean with its expressions. 2
- 5B. Use Chi-Square test to determine whether there really is a relationship between an employee's performance in the company's training program and his or her ultimate success in the job, the company takes a sample of 400 cases from its very extensive files and obtains the results shown in the following table 3

Performance in training program --->

	Below Average	Average	Above Average	Total
Poor	23	60	29	112
Average	28	79	60	167
Very good	9	49	63	121
Total	60	188	152	400

Use 0.01 level of significance to test the null hypothesis that performance in the training program and success in the job are independent.

- 5C.** Samples of three kind of materials subjected to extreme temperature changes, produced the results shown in the following table: **5**

	Material-A	Material-B	Material-C	Total
Crumbled	41	27	22	90
Remained intact	79	53	78	210
Total	120	80	100	300

Use 0.01 level of significance to test whether, under the stated conditions, the probability of crumbling is the same for the three kinds of materials.

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