

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: MTECH/PRE-PHD  
BRANCH: ECE**

**SEMESTER : I / NA  
SESSION : MO/18**

**SUBJECT: EC524 MEASUREMENT AND STATISTICS**

**TIME: 3:00 HRS.**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a) List the different functional blocks of a generalized measurement system and demonstrate the function of each block in the measurement process. [5]

Q.1(b) In a test temperature is measured 100 times after variation in apparatus and procedures is given in table below. [5]

TEMP in Centigrade	397	398	399	400	401	402	403	404	405
Frequency of occurrence	1	3	12	23	37	16	4	2	2

Calculate i) arithmetic mean ii) mean deviation iii) standard deviation

Q.2(a) Derive pdf of chi square distribution with n degree of freedom. (CO2) [5]

Q.2(b) In a swimming pool water level was measured at four different corners points and center are shown below. [5]

A		B	Measurement area	A	B	C	D	E
	E		Water Level	112.4	112.5	112.0	112.6	112.3
D		C						

Test the hypothesis that water level is not dependent at the any corner or center of the swimming pool. Tabulated Chi Square for 4 degree of freedom is 9.488 at the 5% level of significance.

Q.3(a) Define the following for the Gaussian distribution of data. [5]

i) Precision Index ii) Probable error ii) standard deviation of mean

Q.3(b) Calculate the correlation coefficient for the following heights (in inches)of father (F) and son (S) [5]

F	65	66	67	67	68	69	70	72
S	67	68	65	68	72	72	69	71

Q.4(a) i) Draw equivalent electrical circuit of a first order measurement system and analyze it for step input. [5]

ii) A thermometer has a time constant of 3.5s. It is quickly taken from a temperature 0°C to a water bath having 100°C. What temperature will be indicated after 1.5s?

Q.4(b) What is an outlier? What are the causes of outliers? How these are detected? [5]

Q.5(a) Design a pressure measurement and digital display system using strain gauge. [5]

Q.5(b) Write Notes on. [5]

i) Ultrasonic transducers ii) Tachometers

:::07/12/2018 M:::