

Assignment Booklet

CCOMO Programme

Certificate (Conditioning Monitoring)

Assignments	
MET-001	Meterology, Instrumentation and tribology
MET-002	MECHATRONICS
MET-003	Conditioning Monitoring and Maintenance Engineering
MST-005	Foundation in Mathematics and Statistics



**SCHOOL OF ENGINEERING & TECHNOLOGY
INDIRA GANDHI NATIONAL OPEN UNIVERSITY**

Maidan Garhi, New Delhi – 110 068

JULY 2022

Dear Student,

Please read the information on assignments in the Programme Guide that we have sent you after your enrolment. A weightage of 30%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this Programme. The assignment for CCOMO (Certificate in Conditioning Monitoring) has been given in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment, please read the following instructions carefully:

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLLMENT NO :

NAME :

ADDRESS :

.....

.....

PROGRAMME CODE:

COURSE CODE:

COURSE TITLE:

STUDY CENTRE: DATE:

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only A4 size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) **This assignments submitted should be hand written in your own hand writing.**

We strongly suggest that you should retain a copy of your answer sheets.

- 6) **You cannot fill the Exam Form without** submission of the assignments. So solve it and **submit it at the earliest**. If you wish to appear in the **TEE, December 2022**, you should submit your TMAs by **31st October, 2022**.
- 7) Assignments will be submitted at **SOET, Academic Block C, SOET, IGNOU, Maidan Garhi, Pin Code-110068** or you may also email at ssrivastav@ignou.ac.in .

We wish you good luck!

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TUTOR MARKED ASSIGNMENT

MET-001

Meterology, Instrumentation and Tribology

Maximum Marks : 100

Weightage : 30%

Course Code: MET- 001

Last Date of Submission: 31st October, 2022

Note : All questions are compulsory. This assignment is based on all Blocks of Meterology, Instrumentation and Tribology.

Max Marks: 100

All questions carry equal marks

Q.1. Classify the types of error and discuss them in detail.

Q.2. Define the following terms:

- (a) Arithmetic mean
- (b) Deviation
- (c) Standard Deviation
- (d) Variance
- (e) Geometrical mean

Q.3. Discuss in detail the various types of 'Fits'.

Q.4. What is tolerance? Describe in detail unilateral and Bilateral tolerance with neat sketches.

Q.5. Describe 'plug' and 'snap' gauges with neat sketches.

Q.6. Explain, in detail the construction and working of a vernier calipers.

Q.7. Discuss, in detail any one of the electrical measuring devices.

Q.8. Name the parts of a universal bevel protractor and state the functions of each.

Q.9. Enlist and describe in detail the parts of a projector

Q.10. Name three types of mechanism of lubrication and discuss any one mechanism in detail.

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TUTOR MARKED ASSIGNMENT

MET-002 MECHATRONICS

**Maximum Marks : 100
Weightage : 30%**

**Course Code: MET- 002
Last Date of Submission: May 15, 2022**

Note : All questions are compulsory. This assignment is based on all Blocks of MECHATRONICS.

Max. Marks :100

1. Distinguish between the following:
 - (a) Open loop and closed loop control system
 - (b) Hydraulic sensors and Pneumatic sensors
2. Explain in detail, the working principle of brushless DC permanent magnetic motor.
3. What are the advantages and limitations of capacitive proximity switch over inductive proximity switch.
4. Explain the working principle of relay with the help of a neat sketch.
5. Mention the function of a mechatronic system. What are the elements of a mechatronic system?
6. Explain the working and construction of Hall Effect Sensor, Thermocouples and RTD.

7. Discuss how velocity is measured using electro magnetic sensors.
8. Explain the working principle of stepper motor with neat sketch.
9. What do you mean by inverse kinematics ? Briefly explain the importance of path planning.
10. Write short notes on the following:
 - (a)Temperature transducers
 - (b)Ladder Diagram

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TUTOR MARKED ASSIGNMENT

MET-003

Condition Monitoring and Maintenance Engineering

Maximum Marks : 100
Weightage : 30%

Course Code: MET- 003
Last Date of Submission: 31st October, 2022

Note : All questions are compulsory. This assignment is based on all Blocks of Conditioning Monitoring and maintenance Engineering.

Max Marks: 100

Attempt all questions. All questions carry equal marks.

1. Name the various functions of plant engineering and explain any one of them in detail.
2. Discuss in detail any two types of time based maintenance.
3. Enumerate the objectives of process FMEA.
4. Explain the fault diagnosis or diagnostic maintenance approach to condition based maintenance.
5. Name and discuss in detail the two fold principles of condition based maintenance.
6. Explain any two techniques of condition monitoring in detail.
7. Describe the types of failure based on volume and mode of failure.
8. The reliability of four components connected in parallel set up are given as $R_1=0.6$, $R_2=0.7$, $R_3=0.8$, $R_4=0.9$. Find the overall reliability of the system. What will be the change in the system reliability if the reliability of the third component is i) increased to 0.9, and b) decreased to 0.7 ?
9. Define availability and discuss its classifications in detail.
10. What are the benefits of vibration analysis and diagnostic software? Also enlist the benefits of vibration monitoring.

TUTOR MARKED ASSIGNMENT

MST-005: Statistical Techniques

Course Code: MST-005

Assignment Code: MST-005/TMA/2022

Maximum Marks: 100

Note: All questions are compulsory. Answer in your own words.

- State whether the following statements are true or false and also give the reason in support of your answer: **(2×5=10)**
 - The total number of all possible samples of size 2 without replacement from a population of size 7 is 21.
 - Consecutive 3 random numbers starting from 8937 by 'middle square method' are 8937, 8699, 6726.
 - RBD is suitable in situations where it is not possible to divide the experimental material into a number of homogeneous blocks.
 - As we increase the sample size, representativeness of the population by the sample decreases.
 - In a big hall, there are 50 rows and each row has 60 students. A research scholar selects 10 rows randomly and then randomly selects 15 students from each selected row. It is an example of cluster sampling procedure.
- Draw all possible samples of size 2 from the population [2, 3, 4] and verify that $E(\bar{x}) = \bar{X}$. Also find variance of \bar{x} . **(10)**
 - A sample of 60 students is to be drawn from a population consisting of 600 students belonging to two villages, A and B. The means and standard deviations of their marks are give below:

Villages	Stratum sizes (N_i)	Means (x_i)	Standard deviations
Village A	400	60	20
Village B	200	120	80

What are the sample sizes for the two villages using proportional allocation technique? **(6)**

- To determine the yield rate of wheat in a district of Punjab, 6 groups of 6 plots each were constructed. The data are given in the following table:

Plot No.	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
1	8	6	18	13	17	12
2	13	5	8	7	15	15
3	11	16	6	13	10	11
4	26	5	10	6	21	17
5	13	16	16	7	20	8
6	31	5	20	2	25	10

Select a cluster sample of 3 clusters from the above data and find its sample mean. Further, explain the procedure of two-stage sampling if we want to draw a sample of 6 plots. Which are the 6 plots in your sample? **(7)**

4. The following data relate to production in kg of three varieties P, Q, R of wheat:

P :	14	16	18		
Q :	14	13	15	22	
R :	18	16	19	15	20

Is there any significant difference among the three varieties at 5% level of significance? (7)

5. A researcher wants to test four diets A, B, C, D on growth rate in mice. These animals are divided into 3 groups according to their weights. Heaviest 4, next 4 and lightest 4 are put in Block I, Block II, and Block III, respectively. Within each block, one of the diets is given at random to the animals. After 15 days, increase in weight is noted, which is given in the following table:

Blocks	Treatments/Diets			
	A	B	C	D
I	12	8	6	5
II	15	12	9	6
III	14	10	8	5

Perform a two-way ANOVA to test whether the data indicates any significant difference between the four diets due to different blocks. (10)

6. In the following data, two values are missing. Estimate these values by Yates method and analyse the data by suitable technique.

Treatments	Blocks		
	I	II	III
A	12	14	12
B	10	y	8
C	x	15	10

(12)

7. Identify the design given in the following table and then carry out the analysis:

Column	Row			
	I	II	III	IV
I	A 8	C 18	B 11	D 8
II	C 16	B 10	D 7	A 4
III	B 12	D 10	A 6	C 20
IV	D 10	A 9	C 28	B 16

(14)

8. (a) The distribution function of Pareto distribution is given by $f(x) = 1 - \left(\frac{k}{x}\right)^a$, $a > 0, 0 < k \leq x$.

Given a $U \sim U(0, 1)$, generate a random number from the above distribution, when $a = 2$ and $k = 1$. Suppose $U = 0.5$, then find x . (4)

(b) Generate a complete cycle for the LCG given below: $x_i = (5x_{i-1} + 3) \bmod 16$, with $x_0 = 5$. A man tosses an unbiased coin ten times. Using the first ten random numbers generated above, obtain a sequence of heads and tails by taking Head (H) as $u \geq 0.5$. **(10)**

9. Times between successive crashes of a computer system were generated for a 6-month period and are given in increasing order as follows (time in hours):

1	10	20	30	40	52	63	70	80	90	100	102
130	140	190	210	266	310	530	590	640	1340		

The parameter $\alpha = 0.00435$, mean = $1/\alpha = 230$ hrs.

Use the Kolmogorov-Smirnov test to examine the goodness of fit of exponential distribution.

(10)