



Sanjay Ghodawat University, Kolhapur

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2018-19

EXM/P/09/01

Year and Program: 2018-19

School of Technology

Department of
Mechanical, Civil, Electrical, Electronics
and CSE

Course Code

Course Title

M Tech Semester – I

RESEARCH METHODOLOGY

(Common to all programs)

Day and Date

End Semester Examination
(ESE)

Time: Max Marks: 100

Monday 17 DEC 18

10:00 to 1:00 pm

- Instructions:**
- 1) Attempt all questions
 - 2) Figures to the right indicate Marks, Bloom's level and Cos.
 - 3) Use of non-programmable Calculators and statistical tables are permitted.

Q.1	Solve Any Two	Marks	Bloom's Level	CO
a)	Recommend with justification the type of research in the following situations: <ul style="list-style-type: none">i. Effect of implementation of Just in Time manufacturing on production performance of the firm.ii. Optimization of manpower requirements under skill constraints.iii. Development of corrosion resistant coating material for under water structuresiv. Investigation of changing life style on consumer buying preferences	08	L4	CO1
b)	Explain with illustration the application of following creative problem solving techniques. (Any Two) <ul style="list-style-type: none">i. Brain Stormingii. Delphi techniqueiii. TRIZ (Inventive Problem Solving)	08	L2	CO1

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|----|--|----|----|-----|
| c) | With reference to literature review, explain the following : | 08 | L2 | CO2 |
| | i. Need for literature review | | | |
| | ii. Steps in making a literature review | | | |
| | iii. Referencing styles | | | |

Q.2 Solve any Two

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|----|--|----|----|-----|
| a) | Illustrate with example under what situations the following research modelling techniques are used : | 07 | L3 | CO4 |
| | i. Simulation Modelling | | | |
| | ii. Meta heuristics | | | |
| | iii. Mathematical modelling | | | |
| b) | A company's sales for the last two years is on the decline and company is worried about the future of sales of company's products. The management of the company is keen to investigate the reasons for decreasing sales and you are hired as consultant to investigate the problem. | 07 | L5 | CO4 |
| | i) How do you go about investigating the issue? Mention the techniques. | | | |
| | ii) If you select the survey method ,How do you go about designing the survey instruments, what scales you use ,how you select the sample and how do you analyze the data | | | |
| c) | Compare the following experimental strategies, | 07 | L2 | CO6 |
| | a) best guess approach | | | |
| | b) one factor at a time (OFAT) | | | |
| | c) Factorial design. | | | |
| | Use minimum 4 criteria's for comparison | | | |

Q.3 Solve any Two

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|----|--|----|----|-----|
| a) | Illustrate the process of Research design with example. What are the characteristics of a good research problem | 08 | L3 | CO1 |
| b) | Explain the following with examples | 08 | L2 | CO3 |
| | i) Dependent and independent variables. | | | |
| | ii) Response variables | | | |
| | iii) Controllable and uncontrollable variables | | | |
| c) | A Master student is keen on investigating the introduction of a new material called Graphene which has lot of applications in major engineering design- like coating of tools to increase hardness, manufacturing of electronics component which is transparent and flexible, graphic batons, graphic electronics for touch screens. And also in corrosion resistant coating in sultry conditions in structures. | 08 | L5 | CO5 |

Prepare a research proposal for systematically conducting research.

Q.4 Solve any Two

- a) An industrial Engineer is conducting an experiment on eye focus time. He is interested in the effect of the distance of the object from the eye on the focus time. Four different distances are of interest. He has five subjects available for experiment. Because there may be differences among individuals, he decided to conduct experiments in a randomized block design. The data obtained is given in the table below. Analyses the data from this experiment (use $\alpha = 0.05$) and draw appropriate Conclusions.

Subject

Distance (Ft)	1	2	3	4	5
4	10	6	6	6	6
6	7	6	6	1	6
8	5	3	3	2	5
18	6	4	4	2	3

- b) Explain with an example, the two factor fractional design. Discuss with an example the main effect and interaction effect for the two factor fractional design.
Represent graphically the main and interaction effects

- c) A mechanical engineer is studying the thrust developed by a drill press. He suspects the drilling speed and feed rate of material are the most important factors. He selects four feed rates and uses a high and low drill speed chosen to represent extreme operating conditions He obtains the following results.

Analyze data and draw conclusions. Use $\alpha = 0.05$

Feed rate

Drill speed	0.015	0.030	0.045	0.060
125	2.70	2.45	2.60	2.75
	2.78	2.49	2.72	2.86
200	2.83	2.85	2.86	2.94
	2.86	2.80	2.87	2.88

Q.5 Solve any Two

- a) Explain Taguchi concept of quality and Taguchi loss functions and their expressions.
- b) Explain the significance of fractional factorial design and illustrate with an example when you recommend this design. Illustrate using example

c)	Explain the orthogonal arrays and how you choose the orthogonal arrays.	8	L3	CO6
Q.6	Explain in brief any Three			
a)	ANOVA for fixed effect model in single factor experiment	6	L2	CO6
b)	Randomized complete block design	6	L2	Co6
c)	Signal to noise ratio and its effect	6	L2	CO6
d)	Concept of parameter design and robust design	6	L2	CO6