Sanjay Ghodawat University, Kolhapur

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

Year and Program:2019-20

M Tech Civil (Structures),
M Tech Civil Construction Engineering & Management ,
M Tech Electrical Engineering

School of Technology

Department of Civil Engineering ,
Department of Electrical Engineering
Electrical Engineering

Course Code	**Course Title**	**M Tech Semester – I**
CET504R1,ELE501	**RESEARCH METHODOLOGY**	
	(Common to all programs)	
Day and Date Thursday 26/12/19	**End Semester Examination**	**Time:** 3hr 10.30 am to 1.30 pm
		Max Marks: 100

Instructions: 1) Attempt all questions

2) Figures to the right indicate full marks, Bloom's level and Cos.

3) Use of non-programmable Calculators and statistical tables are permitted.

		Marks	Bloom's Level	CO
1	**Solve Any Two**			
a)	Recommend with justification the type of research methods in the following situations: **(Any Four)**	08	L4	CO1
	i. Studying the effect of admixtures on strength and properties of concrete			
	ii. Development of corrosion resistant coating material for under water structures			
	iii. Increasing the performance and life of batteries in Electric vehicles			
	iv. Inventing an alternative to the natural sand			
	v. Effectiveness of installation of smart grids in India			
	vi. Studying the cause and effect of economic recession on Indian industries			
	vii. Study of problems and prospects of E commerce in Indian			

ESE

Context

b)	An inventor has come across a new additive (solution) which when added to the automobile fuel in small quantity (About 100 ml in one liter of fuel) will increase the mileage of the vehicle by 30%.This additive has been prepared by the inventor from the commonly available herbs. This has been tested by many and all those who used are positive about the improvement in mileage of vehicles. The inventor became the talk of the town and getting lot of publicity through both print and electronic media. All TV channels broadcasted his interview and The inventor expressed his wish to shortly patent the additive formula and exploit it commercially on a large scale i. Is it a scientific research? Justify your answer. ii. What are the characteristics of scientific research iii. Do you support the inventor's idea of obtaining a patent and commercialization of product? iv. Differentiate between Research ,Creativity and Innovation	8	L2	CO1
c)	A young M Tech student working on a novel research problem is keen to get funding for his research by preparing and sending a research proposal to funding agency. He is fully aware of the requirements for a winning proposal. Prepare a concise research proposal for funding as per the standard format.	08	L2	CO2
2	**Solve any Two**			
a)	Illustrate with example under what situations the following research modelling techniques are used : **(Any four)** i. Simulation Models ii. Experimental Techniques iii. Mathematical models iv. Heuristic models v. Iconic models	08	L3	CO3

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b)	What is validity and reliability of research? How they are established. Explain methodology for establishing validity and reliability for a questionnaire designed in survey research in particular.	08	L2	CO4
c)	How "reinventing **the Wheel** "can be avoided in any research? Explain the steps how literature survey is carried out .What is the purpose of literature survey?	07	L4	CO2

3 Attempt Any Two

a)	Explain the term Research Hypothesis .illustrate with examples how the hypothesis are formulated,. What are the ways the hypothesis are tested .Illustrate the techniques with a sample problems	08	L3	CO4
b)	The time to repair an electronic instrument is normally distributed random variable measured in hours. The repair times for 16 such instruments chosen at random are as follows.	08	L3	CO4

Hours

189	280	201	215
224	379	179	264
222	362	168	250
149	260	485	170

i) You wish to know, if the mean repair time exceeds 225 hours, set up appropriable hypothesis for investigating this issue.
ii) Test the hypothesis you formulated in part (I), what are your Conclusions? Use $\alpha = 0.05$
iii) Find the 'p' value for the test.
iv) Construct a 95 percent Confidence interval on mean repair time.

c)	Explain the following with respect to experimental design i. Experimental; strategy ii. Principles of experimentation iii. Blocking and confounding	08	L2	CO5

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iv. Single factor experiment

4 Attempt Any Two

a) Explain with an example, the two factor factional design. Discuss the main effect and interaction effect for the two factor factional design with example — 08 — L3 — CO5

b) 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. — 08 — L4 — CO5

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

c) Explain how the following techniques are used for analysis of experimental data — 08 — L5 — CO5

i. Regression Analysis
ii. Response surface Methodology
iii.

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5 **Attempt Any Two**

a)	Compare full factorial experiment with Fractional factorial experiments, how the fractional factorial experiments are designed Under what conditions it is recommended?	09	L5	CO:
b)	Demonstrate with an illustration how ANOVA is used for analysis of two factors at two level experiments (2^2 Experiments)	09	L3	CO:
c)	Explain the steps in Taguchi design of experiments, What are the orthogonal arrays and how they are selected?	09	L2	CO:
6 a)	Explain with an example the Taguchi's approach of parameter and robust design	09	L3	CO:
b)	Illustrate the following concepts i. Taguchi loss functions and their expressions. ii. Nominal the Best iii. Signal to noise ratio and its significance	09	L2	CO:
c)	An experiment was conducted to study the life (in hrs.) 4 of two different brands of batteries in three different devices. (Radio, camera, DVD player) A completely randomized two factor factorial design experiment was conducted and the following data resulted.	09	L4	CO

Brand of Battery	Radio	Camera	DVD
A	8,6	7.8	5.5
	8.2	8.4	5.7
B	9.4	8.5	5.8
	9.8	8.9	9

(a) Analyze the data and draw conclusions using α = .05
(b) Investigate model adequacy by plotting residuals
(c) Which brand of batteries do you recommend?

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