


Set-1

	Sanjay Ghodawat University, Kolhapur Established as State Private University under Govt. of Maharashtra. Act No XL, 2017		
FY M Tech	School of Technology Department of Mechanical Engineering		
MDM 501 FES, CCC	Research Methodology		Sem-I
16DEC2017	Examination: ESE, Max Marks: 100, Time 3 Hrs		

Instructions:

- 1) All Questions are compulsory.
- 2) Assume missing data, if any and state the assumptions clearly.

Q.1	Write short notes on any three of the following.	Marks	CO																				
	a) Objectives of Research b) Features of a Good Research Design c) Need for sampling d) Errors in measurement	6x3= 18																					
Q.2																							
	a) Explain in detail, Literature Review and its necessity.	8																					
	b) Explain in brief, Randomization, Replication and Blocking.	8																					
Q.3																							
	In an experiment, following readings were noted. Based on these, find the relationship between x and y , such that, $y = a + bx + cx^2$. <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>y</td><td>2.89</td><td>6.11</td><td>12.74</td><td>24.30</td><td>38.88</td><td>58.05</td><td>80.94</td><td>108.31</td><td>140.21</td></tr></table>	x	1	2	3	4	5	6	7	8	9	y	2.89	6.11	12.74	24.30	38.88	58.05	80.94	108.31	140.21	16	
x	1	2	3	4	5	6	7	8	9														
y	2.89	6.11	12.74	24.30	38.88	58.05	80.94	108.31	140.21														
Q4	Write short notes on any three of the following.																						
	a) Hypothesis b) Selection of Research Problem c) Orthogonal Arrays d) Taguchi Technique	6x3= 18																					
Q5																							
	In a multivariate research, experiments were carried out to test the effect of type of fertilizer and type of insecticide on production per	16																					

acre (in tonnes) of a particular crop. All other variables like area of plots, quality of soil, pH balance, type of seeds, etc. were maintained at constant value throughout the experiments. Carry out a two way ANOVA test to test the significance of both the variables at 1% significance level.

Fertilizers \Rightarrow Insecticides \Downarrow	Fertilizer A	Fertilizer B	Fertilizer C	Fertilizer D
Chemical L	12	15	17	18
Chemical M	17	21	23	25
Chemical N	20	23	26	30
Chemical O	25	29	34	37
Chemical P	29	34	38	43

Note:

At $\alpha = 0.01$, Critical F Value for (4,12) = 5.4120

At $\alpha = 0.01$, Critical F Value for (3,12) = 5.9525

Q6

In a research, experiments were carried out to test the effect of type of welding rod on joint strength. Four types of welding rods were used to join identical workpieces in each experiment. All other variables were kept constant. Carry out one way ANOVA test to test the significance of changing the type of welding rods at 5% significance level.

Welding Rod \Rightarrow Experiment No. \Downarrow	Rod A	Rod B	Rod C	Rod D
1	25	32	41	49
2	27	30	39	50
3	23	33	40	49
4	26	34	42	48
5	28	32	43	50

16

Note: At $\alpha = 0.05$, Critical F Value for (3,16) = 3.2289
