RESEARCH METHODOLOGY AND IPR
(REEN 5103)

Time Allotted : 2½ hrs   **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 4 (four)</u> from Group B to E, taking <u>one</u> from each group.
F- Table will be supplied.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

    Choose the correct alternative for the following

    (i)   Type I error is synonymous with
    (a) Producers' risk   (b) Consumers' risk
    (c) Quality Control Professionals' risk   (d) Benefit of everyone

    (ii)   A research thesis should not contain
    (a) Literature Survey   (b) Materials and Methods
    (c) Advertisement of Outcome   (d) Results and Discussion

    (iii)   Assay technique in research thesis is included in
    (a) Literature Survey   (b) Materials and Methods
    (c) Aims & Objectives   (d) Results and Discussion

    (iv)   Mathematical Statistics is
    (a) Measurement of Inputs   (b) Mode of Analysis of Data
    (c) A Simulation Technique   (d) Application of Probability Measure

    (v)   Out of the names of four Software given below, three serves similar purpose, identify the odd name
    (a) Lotus 123   (b) MS- Excel   (c) Numbers   (d) AutoCAD

    (vi)   Interpretation of ANOVA needs
    (a) Gantt Chart   (b) t-distribution Chart
    (c) F-distribution Chart   (d) Chi-square- distribution Chart

    (vii)   Out of the names of four Software given below, three serves similar purpose, identify the odd name
    (a) Lotus 123   (b) MS- Publisher (c) Photoshop   (d) CorelDraw

    (viii)   Central Limit Theorem reduces all distribution to
    (a) Poisson Distribution   (b) t-distribution
    (c) Normal distribution   (d) Chi-square- distribution

(ix) In Testing of Hypothesis, rejection of Null Hypothesis means
(a) Rejection of Alternate Hypothesis
(b) Acceptance of Alternate Hypothesis
(c) The design of experiment process fails
(d) Stochastic model will be befitting

(x) 95% Confidence Interval means
(a) 95% Level of Significance
(b) 100% Level of Significance
(c) 10% Level of Significance
(d) 5% Level of Significance

Fill in the blanks with the correct word

(xi) p-Chart belongs to _____ Control Chart.

(xii) The SWOT Analysis is a Type _____ Technique.

(xiii) Acceptance Sampling is used for Quality Assurance of materials those involve _____ Test.

(xiv) Utility Patents are issued for inventions that are _____ and useful.

(xv) The Pareto Analysis is a Type _____ Technique.

Group - B

2. (a) Enumerate the five main characteristics of Research. *[(CO1)(Remember/LOCQ)]*
   (b) You are applying for a PhD program in abroad. The advisor requested you develop your SOP. Present this in form of a Case Study. *[(CO4)(Analyze/IOCQ)]*
   5 + 7 = 12

3. (a) What is the role of a Leader in a Quality Circle? *[(CO4)(Remember/LOCQ)]*
   (b) A Q.C. was formed in a production unit of a Renewable Energy Industry. In the first meeting an effective brainstorming was conducted and the circle identified a problem pertaining to the same work area. In a next meeting the members identified 20 causes of the selected problem under four sub-heads. Considering you to be the leader of the circle present this case study and draw an Ishikawa diagram. *[(CO4)(Evaluate/HOCQ)]*
   2 + 10 = 12

Group - C

4. Samples of two types of electric light bulbs were tested for length of life and following data were obtained:

	Type I	Type II
Sample No.	n_1=8	N_2=7
Sample Means	$\bar{x}_1$=1234 hrs.	$\bar{x}_2$=1036 hrs.
Sample St. Deviations	s_1=36 hrs.	S_2=40 hrs.

(i)   Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life?

[Use the following table to justify your prediction.]

Level of Significance	0.05					
Degrees of Freedom	10	11	12	13	14	15
Response	1.812	1.796	1.782	1.771	1.761	1.753

[(CO2)(Evaluate/HOCQ)]

(ii)   State the importance of Pearson Rank Correlation Coefficient.   *[(CO2)(Remember/LOCQ)]*

(10 + 2) = 12

5.   A soft drink bottler is interested in obtaining more uniform fill heights in the bottles produced by his manufacturing process. The filling machine theoretically fills a bottle to reach the correct target height, but in practice, there is variation around the target, and the bottler would like to understand better the sources of this variability and eventually reduce it. The process engineer can control three variables during the filling process. The percent carbonation (A), the operating pressure in the filter (B), and the bottles produced per minute or the line speed (C). the pressure and speed are easy to control, but the percent carbonation is more difficult to control during actual manufacturing because it varies with product temperature. However, for purposes of an experiment, the engineer can control carbonation at three levels: 10, 12, & 14 percent. He chooses two levels for pressure (25 and 30 psi) and two levels for line speed (200 and 250 bpm). He decides to run two replicates of a factorial design in these three factors, with all 24 runs taken in random order. The response variable observed is the average deviation from the target fill height observed in a production run of bottles at each set of conditions. The data that resulted from the experiment are shown in below. Positive deviations are fill heights above the target, whereas negative deviations are fill heights below the target:

Percent carbonation (A)	Operating pressure (B)				y_i
	25 psi		30 psi		
	Line Speed(C)		Line Speed (C)		
	200	250	200	250	
10	-3	-1	-1	1	-4
	-1	0	0	1	
12	0	2	2	6	20
	1	1	3	5	
14	5	7	7	10	59
	4	6	9	11	

(i) Predict a suitable factorial experiment model for the problem.   *[(CO4)(Analyze/IOCQ)]*
(ii) Analyse the data using ANOVA and draw your conclusions.   *[(CO4)(Evaluate/HOCQ)]*

4 + 8 = 12

Group - D

6.   (a)   Discuss the methodology of using STATISTICA .   *[(CO3)(Analyse/IOCQ)]*
    (b)   What is SPSS? Discuss its various purviews.   *[(CO4)(Analyze/IOCQ)]*

6 + 6 = 12

7. (a) You are to prepare a 3'x4' poster from a ppt. Discuss the steps you are required to follow. *[(CO1)(Analyse/HOCQ)]*
    (b) Evaluate a layout of the process. *[(CO1) (Remember/LOCQ)]*
    (c) State the characteristics of a Software used for this purpose. *[(CO1)(Analyze/IOCQ)]*

    4 + 4 + 4 = 12

Group - E

8. (a) What is Patent? *[(CO5)(Remember/LOCQ)]*
    (b) In India, a Patentee does not enjoy an Absolute Ownership of a Technology- Justify the statement. *[(CO5)(Analyze/IOCQ)]*
    (c) Inventions falling within the scope of Sec. (3) of Patents Act, 1970 cannot be patented. *[(CO5)(Analyze/IOCQ)]*

    4 + 4 + 4 = 12

9. (a) Discuss the role of Chicago Manual of Style in writing Scientific Dissertation. *[(CO5)(Remember/LOCQ)]*
    (b) Analyze the Step by step procedure of filing a patent in India. *[(CO5)(Analyze/IOCQ)]*

    5 + 7 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	15.6	41.7	42.7

Course Outcome (CO):

After completion of the course the students will be able:
1. To understand research problem formulation.
2. To analyze research related information.
3. To Follow research ethics.
4. To carry out research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
5. To understand that when IPR would take such important place in growth of individuals & nation and its protection would provide an incentive to inventors for further Research and Development

LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.