ParvathaneniBrahmayya

Siddhartha College of Arts & Science, Vijayawada

Course Code:**STASET02**
Offered to: Offered to: **B.A(EMS)/B.Sc. (M.S.Cs., Ca.M.S., M.S.Ds)**
Domain Subject: STATISTICS Semester – **V**
Max. Marks: **100** (CCIA: 25+ SEE:75) Theory Hrs./Week: **3**

Title of the paper: OPERATIONS RESEARCH-II

Type of the Course: **Skill Enhancement Course** (Elective Theory), Credits: **04**

Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Obtain the knowledge and applications of sequencing models.(PO-5)
CO2: Understand the concepts of replacement.(PO-5)
CO3: Develop the different models of game strategies(PO-6)
CO4: Develop skills in construction of network diagram, apply the techniques of CPM and PERT (PO-5)
CO5: Explain clearly the Distinguishes features of Queuing models. (PO-6)

Syllabus
(Total Theory Hours: 45)

UNIT-I **(9 Periods)**

Problem of Sequencing:

Introduction, Principal Assumptions, Solution of Sequencing Problem- Processing n jobs through 1-Machine, Processing n jobs through 2-Machines and Processing n jobs through 3-Machines- Johnson's Optimal sequence Algorithm. Processing n jobs through k-Machines- Johnson's Optimal sequenceAlgorithm. Simple problems.

UNIT-II **(9Periods)**

Replacement Problem

Introduction, Replacement of items that deteriorate- Replacement policy for items whose maintenance cost increases with time and money value is constant. And money Value changes with constant rate. Replacement of items that fail completely - Group replacement of items that fail completely.

UNIT-III **(9 Periods)**

Game Theory

Two-person zero-sum games. Pure and Mixed strategies. Maximin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property.

UNIT-IV **(9 Periods)**

Network Scheduling by PERT/CPM

Basic steps in PERT/CPM techniques, Basic components, Logical sequencing (errors in drawing networks), Rules for network construction, Critical path analysis, Forward pass Method, Backward pass Method Determination of floats and slack times. Probability considerations in PERT (Project

Evaluation and Review Technique). Distinction between PERT and CPM, Applications of network techniques, Limitations and difficulties in using Network. Simple problems.

UNIT-V **(9 Periods)**

Queuing theory

Classification of queuing models- Probabilistic Queuing Models, Solution of Queuing models, Limitation for application of Queuing models, Poisson queuing systems-**Model I**:(M/M/1):(∞ / FIFO)- Birth and Death Model. Characteristics of (M/M/1): (∞ / FIFO), $E(L_q), E(L_s),$ $E(L/L>0), V(\textit{Queue Length})$ .PDF of Waiting time distribution for (M/M/1): (∞ / FIFO), Characteristic of waiting time distribution(M/M/1): (∞ / FIFO), 1. $E(W_q), E(W_s)$, 2. $E(W/W>0)$. Inter- Relationship between $E(L_q), E(L_s) E(W_q), E(W_s)$ Simple problems.

Text Book:

1. KantiSwarup, P.K.Gupta , Man Mohan,Operations Research, 15th Edition, 2010, Sultan Chand & Sons, New Delhi.

List of Reference Books:

1. Quality,Reliability& Operations Research, First Edition (2010), Published by Telugu Akademi,Hyderabad.
2. Operations Research Theory, Methods and Applications, S.D. Sharma, Himanshu Sharma, improved and enlarged edition, KedarNathRamNath& Co., Meerut.
3. Kirshna's Operations Research, Dr. R. K. Gupta, 27 thEdition , 2010, Krishna Prakashan Media (P) Ltd., Meerut.
4. Operations Research: Theory and Applications, J.K.Sharma, 5th Edition, 2013, Macmillan.
5. Operations Research: An Introduction, Hamdy. A. Taha, 9th edition ,2010, Prentice Hall.

Co-Curricular Activities

(a) Mandatory: (Training of students by teacher in field related skills:
(lab:10 + field: 05)

For Teacher: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for a total of not less than 15 hours on the field techniques/skills on the familiarization of various operating systems and program softwares.

For Student: Students shall (individually) operating the computers and execution of their programmes for data analysis

Student shall write the observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.

1. Max marks for Fieldwork/Project work: 10.
2. Suggested Format for Fieldwork/Project work: Title page, student details,
3. index page, details of place visited, observations, findings and acknowledgements.
4. Comprehensive Continuous Internal Assessment (CCIA): (2 tests will be conducted, each carries 30 Marks, consider Average Mark: 15)

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Model paper

Course Code: STASET02

OPERATIONS RESEARCH-II

SECTION A

Answer any FIVE questions. **5 X 5M=25M**

1. Describe the method of processing n jobs through two machines?
2. What are the objectives of sequencing problem?
3. Write a short note on i) PERT ii) CPM iii) project duration evaluation.
4. Write a short note on characteristics of Game theory.
5. Write a short note on individual replacement and group replacement?
6. Define (i) Competitive Game, (ii) Payoff Matrix, (iii) Pure and Mixed Strategies
7. Write the basic characteristics of queue system
8. What are Transient and Steady states cases in queuing theory?

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SECTION B

Solve any FIVE problems. **5 X 10M =50M**

9. (a) five jobs have to processed through two machines in the order AB. Determine the optimal sequence.

Job	1	2	3	4	5
Machine A	1	9	5	3	8
Machine B	2	5	6	8	4

(OR)

(b) What is a sequencing analysis? Illustrate with some practical examples.

10. (a) A manufacturer is offered two machines A and B. A is priced at Rs.5,000, and runningcosts are estimated at Rs.800 for each of the first five years, increasing by Rs.200 per year in the sixth and subsequent years. Machine B, which has the same capacity as A, costs Rs.2,500 but will have running costs of Rs.1,200 per year for six years, increasing by Rs.200 per year thereafter. If money is worth 10% per year, which machine should be purchased? (Assume that the machine will eventually sold for scrap at a negligible price.)

(OR)

(b) The following failure rates have been observed for a certain type of light bulbs:

week :	1	2	3	4	5
% failing by end of week:	10	25	50	80	100

There are 1,000 bulbs in use, and it costs Rs 2 to replace an individual bulb whichhas burnt out. If all bulbs were replaced simultaneously, it would cost 50 paisa per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out, and to continue replacing burnt out bulbs as they fail. At what interval should all the bulbs be replaced?

11. (a) Solve the following game using dominance property

		player B			
		I	*II*	*III*	*IV*
	I	3	2	4	0
Player A	*II*	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

(OR)

(b) Solve the game whose payoff matrix is given by

$$\begin{bmatrix} -2 & 0 & 0 & 5 & 3 \\ 3 & 2 & 1 & 2 & 2 \\ -4 & -3 & 0 & -2 & 6 \\ 5 & 3 & -4 & 2 & -6 \end{bmatrix}$$

12. (a)A project consists of a series of tasks A,B,....H,I with the following relationships (W<X, Y means X and Y cannot start until W is completed; X,Y< W means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints:

A < D, E;	**B, D < F;**	**C < G;**	**B, G < H;**	**F, G < I**

Find also the minimum time of completion of the project, when the time of completion of each task is as follows:

TASK	A	B	C	D	E	F	G	H	I
TIME	23	8	20	16	24	18	19	4	10

(OR)

(b) A small project consists of seven activities, the details of which are given below:

Activity	A	B	C	D	E	F	G
Most likely	3	6	3	10	7	5	4
Optimistic	1	2	3	4	3	2	4
Pesimistic	7	14	3	22	15	14	4
Preceding Activities	-	-	B	C	A, D	D	A, D
Duration	6	5	2	2	2	1	6

(i) Draw the network, number the nodes, find the critical path, the expected project completion time and the next most critical path.
(ii) What project duration will have 95% confidence of completion?

13. (a) Prove that $(i)\ E(L_q)$ $(ii)\ E(L_s)$, for model (M/M/1): $(\infty$ / SIRO)

(OR)

(b) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter - arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average 36 minutes. If the yard can admit 9 trains at a time (there being 10 lines, one of which is reserved for shunting purposes), calculate the probability that the yard is empty and find the average queue length.

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Domain Subject: **STATISTICS** Semester: **V**
Max. Marks: **50** (CCIA: 10+ SEE: 40) Practical Hrs./Week **: 3**

Practical No	**Theme**	**Key Topics**
SPSS TECHNIQUES		
1	Parametric Tests	One Sample, Independent Samples and Paired test
2	Multiple Comparison Tests	One way ANOVA and Two way ANOVA
3	Chi-Square Test	Independence of attributes and Goodness of Fit
4	Non-Parametric Test	Mann Whitney U test, Wilcoxon Signed ranks test, Kruskal Wallis Test and Friedman test
OPERATION RESEARCH TECHNIQUES		
5	Queuing theory	Based on (M/M/1):(∞/FIFO)
6	Game Theory	Solve the game problem by using LPP method, Algebraic Method and graphical method
7	Networking	1. Finding of critical path 2. Project evaluation technique
8	Replacement Problem	Replacement policy for items whose maintenance cost increases with time and money value changes with constant rate and replacement of items that fail completely

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