



ADAMAS UNIVERSITY

END-SEMESTER EXAMINATION : MAY 2021

(Academic Session: 2020 – 21)

Name of the Program:	B. Tech ME	Semester:	VIII
Paper Title :	Operation Research & Production Planning	Paper Code:	EME44111
Maximum Marks :	40	Time duration:	3 Hours
Total No of questions:	8	Total No of Pages:	04
Instruction to the Candidate:	<ol style="list-style-type: none"> 1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. 2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. 3. Assumptions made if any, should be stated clearly at the beginning of your answer. 		

Answer all the Groups

Group A

Answer all the questions of the following

$5 \times 1 = 5$

1.
 - a) What kind of problem we can solve from Operation research?
 - b) Explain various Phases in OR?
 - c) Explain various Applications of OR and its Limitation in details?
 - d) Write a short note on the differences of PERT and CPM method.
 - e) Explain with example 'North West Corner Rule'.

GROUP –B

Answer *any three* of the following

$3 \times 5 = 15$

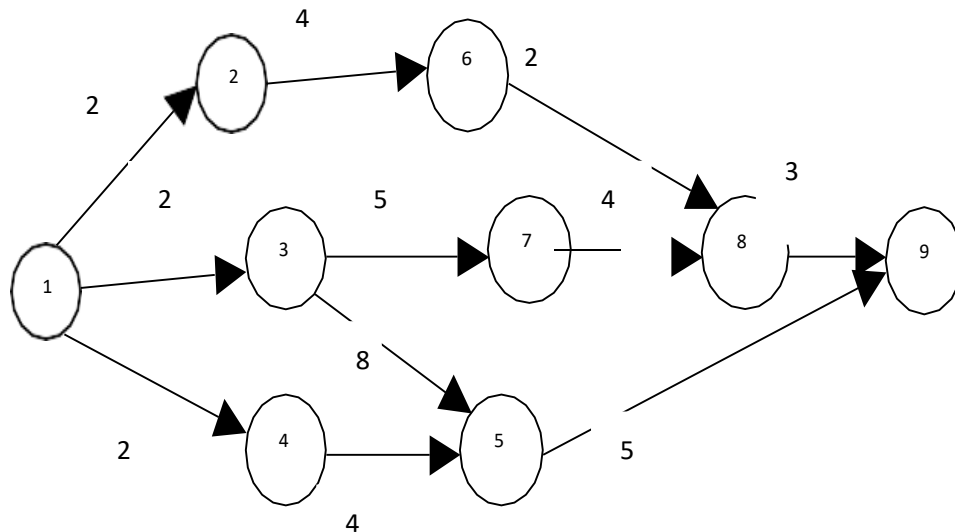
2. Find initial basic feasible solution by 'Vogel's Method' and 'North West Corner Method'.

	Destination					
		1	2	3	4	supply
Source	I	21	16	15	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
	Demand	6	10	12	15	43

3. The Instant Paper Clip Office Supply Company sells and delivers office supplies to companies, schools, and agencies within a 50-mile radius of its warehouse. The office supply business is competitive, and the ability to deliver orders promptly is a big factor in getting new customers and maintaining old ones. (Offices typically order not when they run low on supplies, but when they completely run out. As a result, they need their orders immediately.) The manager of the company wants to be certain that enough drivers and vehicles are available to deliver orders promptly and that they have adequate inventory in stock. Therefore, the manager wants to be able to forecast the demand for deliveries during the next month. From the records of previous orders, management has accumulated the following data for the past 10 months:

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Orders	120	90	100	75	110	50	75	130	110	90

4. Write down the procedure to obtain optimum completion time using Critical Path method.



5. Draw the Network Diagram for the following activities.

Job	A	B	C	D	E	F	G	H	I	J	K
Job time (days)	13	8	10	9	11	10	8	6	7	14	18
Immediate predecessors	-----	A	B	C	B	E	D,F	E	H	G,I	J

GROUP –C

Answer *any two* of the following

$2 \times 10 = 20$

6. A large hotel in a resort area has a housekeeping staff that cleans and prepares all of the hotel's guestrooms daily. In an effort to improve service through reducing variation in the time required to clean and prepare a room, a series of measurements is taken of the times to service rooms in one section of the hotel. Cleaning times for five rooms selected each day for 25 consecutive days appear below. Draw X and R chart. (Table for constant is attached)

	Room 1	Room 2	Room 3	Room 4	Room 5
1	15.6	14.3	17.7	14.3	15
2	15	14.8	16.8	16.9	17.4
3	16.4	15.1	15.7	17.3	16.6
4	14.2	14.8	17.3	15	16.4
5	16.4	16.3	17.6	17.9	14.9
6	14.9	17.2	17.2	15.3	14.1
7	17.9	17.9	14.7	17	14.5
8	14	17.7	16.9	14	14.9
9	17.6	16.5	15.3	14.5	15.1
10	14.6	14	14.7	16.9	14.2
11	14.6	15.5	15.9	14.8	14.2
12	15.3	15.3	15.9	15	17.8
13	17.4	14.9	17.7	16.6	14.7
14	15.3	16.9	17.9	17.2	17.5
15	14.8	15.1	16.6	16.3	14.5
16	16.1	14.6	17.5	16.9	17.7
17	14.2	14.7	15.3	15.7	14.3
18	14.6	17.2	16	16.7	16.3
19	15.9	16.5	16.1	15	17.8
20	16.2	14.8	14.8	15	15.3
21	16.3	15.3	14	17.4	14.5
22	15	17.6	14.5	17.5	17.8
23	16.4	15.9	16.7	15.7	16.9
24	16.6	15.1	14.1	17.4	17.8
25	17	17.5	17.4	16.2	17.9

Observations in Sample, <i>n</i>	Chart for Averages			Chart for Standard Deviations						Chart for Ranges						
	Factors for Control Limits			Factors for Center Line		Factors for Control Limits				Factors for Center Line		Factors for Control Limits				
	<i>A</i>	<i>A</i> ₂	<i>A</i> ₃	<i>c</i> ₄	1/ <i>c</i> ₄	<i>B</i> ₃	<i>B</i> ₄	<i>B</i> ₅	<i>B</i> ₆	<i>d</i> ₂	1/ <i>d</i> ₂	<i>d</i> ₃	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>D</i> ₄
2	2.121	1.880	2.659	0.7979	1.2533	0	3.267	0	2.606	1.128	0.8865	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0.8862	1.1284	0	2.568	0	2.276	1.693	0.5907	0.888	0	4.358	0	2.574
4	1.500	0.729	1.628	0.9213	1.0854	0	2.266	0	2.088	2.059	0.4857	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0.9400	1.0638	0	2.089	0	1.964	2.326	0.4299	0.864	0	4.918	0	2.114
6	1.225	0.483	1.287	0.9515	1.0510	0.030	1.970	0.029	1.874	2.534	0.3946	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.9594	1.0423	0.118	1.882	0.113	1.806	2.704	0.3698	0.833	0.204	5.204	0.076	1.924
8	1.061	0.373	1.099	0.9650	1.0363	0.185	1.815	0.179	1.751	2.847	0.3512	0.820	0.388	5.306	0.136	1.864
9	1.000	0.337	1.032	0.9693	1.0317	0.239	1.761	0.232	1.707	2.970	0.3367	0.808	0.547	5.393	0.184	1.816
10	0.949	0.308	0.975	0.9727	1.0281	0.284	1.716	0.276	1.669	3.078	0.3249	0.797	0.687	5.469	0.223	1.777
11	0.905	0.285	0.927	0.9754	1.0252	0.321	1.679	0.313	1.637	3.173	0.3152	0.787	0.811	5.535	0.256	1.744
12	0.866	0.266	0.886	0.9776	1.0229	0.354	1.646	0.346	1.610	3.258	0.3069	0.778	0.922	5.594	0.283	1.717
13	0.832	0.249	0.850	0.9794	1.0210	0.382	1.618	0.374	1.585	3.336	0.2998	0.770	1.025	5.647	0.307	1.693
14	0.802	0.235	0.817	0.9810	1.0194	0.406	1.594	0.399	1.563	3.407	0.2935	0.763	1.118	5.696	0.328	1.672
15	0.775	0.223	0.789	0.9823	1.0180	0.428	1.572	0.421	1.544	3.472	0.2880	0.756	1.203	5.741	0.347	1.653
16	0.750	0.212	0.763	0.9835	1.0168	0.448	1.552	0.440	1.526	3.532	0.2831	0.750	1.282	5.782	0.363	1.637
17	0.728	0.203	0.739	0.9845	1.0157	0.466	1.534	0.458	1.511	3.588	0.2787	0.744	1.356	5.820	0.378	1.622
18	0.707	0.194	0.718	0.9854	1.0148	0.482	1.518	0.475	1.496	3.640	0.2747	0.739	1.424	5.856	0.391	1.608
19	0.688	0.187	0.698	0.9862	1.0140	0.497	1.503	0.490	1.483	3.689	0.2711	0.734	1.487	5.891	0.403	1.597
20	0.671	0.180	0.680	0.9869	1.0133	0.510	1.490	0.504	1.470	3.735	0.2677	0.729	1.549	5.921	0.415	1.585
21	0.655	0.173	0.663	0.9876	1.0126	0.523	1.477	0.516	1.459	3.778	0.2647	0.724	1.605	5.951	0.425	1.575
22	0.640	0.167	0.647	0.9882	1.0119	0.534	1.466	0.528	1.448	3.819	0.2618	0.720	1.659	5.979	0.434	1.566
23	0.626	0.162	0.633	0.9887	1.0114	0.545	1.455	0.539	1.438	3.858	0.2592	0.716	1.710	6.006	0.443	1.557
24	0.612	0.157	0.619	0.9892	1.0109	0.555	1.445	0.549	1.429	3.895	0.2567	0.712	1.759	6.031	0.451	1.548
25	0.600	0.153	0.606	0.9896	1.0105	0.565	1.435	0.559	1.420	3.931	0.2544	0.708	1.806	6.056	0.459	1.541

For *n* > 25.

$$\begin{aligned}
 A &= \frac{3}{\sqrt{n}} & A_3 &= \frac{3}{c_4 \sqrt{n}} & c_4 &= \frac{4(n-1)}{4n-3} \\
 B_3 &= 1 - \frac{3}{c_4 \sqrt{2(n-1)}} & B_4 &= 1 + \frac{3}{c_4 \sqrt{2(n-1)}} \\
 B_5 &= c_4 - \frac{3}{\sqrt{2(n-1)}} & B_6 &= c_4 + \frac{3}{\sqrt{2(n-1)}}
 \end{aligned}$$

7. Solve the following transportation problem to find its optimal solution: (MODI)

	A	B	C	Available
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Required	4	2	2	

8. Find the critical path and calculate the Total float and Free float for the following PERT diagram

