I. Explanation & Discussion (45% total)

1.1) Briefly describe the term operations management. (5%)

1.2) What are the main advantages that quantitative techniques for forecasting have over qualitative techniques? What limitations do quantitative techniques have? (5%)

1.3) Name some of the main advantages and disadvantages of standardization. (5%)

1.4) What is the goal of line balancing? What happens if a line is unbalanced? (5%)

1.5) In what ways can the location decision have an impact on the production system? (5%)

1.6) Explain each of these methods: (5% each)
   (a) The plan-do-study-act cycle.
   (b) The 5W2H approach.

1.7) What is a supply chain? (5%)

1.8) What are the primary reasons for holding inventory? (5%)

II. Calculating Problems (55%)

2.1) A gift shop in a tourist center is open on weekends (Friday, Saturday, and Sunday). The owner-manager hopes to improve scheduling of part-time employees by determining seasonal relatives for each of these days. Data on recent activity at the store (sales transactions per day) have been tabulated and are shown in the table below.

	Week					
	1	2	3	4	5	6
Friday	149	154	152	150	159	163
Saturday	250	255	260	268	273	276
Sunday	166	162	171	173	176	183

(a) Develop seasonal relatives for the shop. (6%)

(b) Use a naïve trend approach to predict sales transactions for the gift shop in the previous problem for the following week. (6%)

2.2) A large manufacturer of pencil sharpeners is planning to add a new line of sharpeners, and you have been asked to balance the process, given the following task times and precedence relationship. Assume that cycle time is to be the minimum possible. (10%)

(a) Do each of the following:

(1) Draw the precedence diagram.

(2) Assign tasks to stations in order of greatest number of following tasks.

(3) Determine the percentage of idle time.

(4) Compute the rate of output that could be expected for this line assuming a 420-minute working day.

(b) Answer these questions:

(1) What is the shortest cycle time that will permit use of only two workstations? Is this cycle time feasible? Identify the tasks you would assign to each station.

(2) Determine the percentage of idle time that would result if two stations were used.

(3) What is the daily output under this arrangement?

(4) Determine the output rate that would be associated with the maximum cycle time.

Task	Length (minutes)	Immediate Follower
a	0.2	b
b	0.4	d
c	0.3	d
d	1.3	g
e	0.1	f
f	0.8	g
g	0.3	h
h	1.2	end

2.3) Prepare a run diagram for this emergency call data. Use five-minute intervals (i.e., count the calls received in each five-minute interval. Use intervals of 0-4, 5-9, etc.). Note: Two or more calls may occur in the same minute; there were three operators on duty this night. What can you conclude from the run chart? (7%)

| Call	Time	Call	Time	Call	Time
1	1:03	15	1:43	29	2:03
2	1:06	16	1:44	30	2:04
3	1:09	17	1:47	31	2:06
4	1:11	18	1:48	32	2:07
5	1:12	19	1:50	33	2:08
6	1:17	20	1:52	34	2:08
7	1:21	21	1:53	35	2:11
8	1:27	22	1:56	36	2:12
9	1:28	23	1:56	37	2:12
10	1:29	24	2:00	38	2:13
11	1:31	25	2:00	39	2:14
12	1:36	26	2:01	40	2:14
13	1:39	27	2:02	41	2:16
14	1:42	28	2:03	42	2:19

2.4) A mail-order house uses 18,000 boxes a year. Carrying costs are 60 cents per box a year, and ordering costs are $96. The following price schedule applies. Determine: (10%)

(a) The optimal order quantity.

(b) Th number of orders per year.

Number of Boxes	Price per Box
1,000 to 1,999	$1.25
2,000 to 4,999	1.20
5,000 to 9,999	1.15
10,000 or more	1.10

2.5) Eighty units of end item E are needed at the beginning of week 6. Three cases (30 units per case) of J have been ordered and one case is scheduled to arrive in week 3, one in week 4, and one in week 5. **Note:** J must be ordered by the case, and B must be produced in multiples of 120 units. There are 60 units of B and 20 units of J now on hand. Lease times are two weeks each for E and B, one week for J.

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                    E
          ┌─────────┼─────────┐
        B(2)              J(3)
     ┌────┴────┐
   J(4)      F(2)
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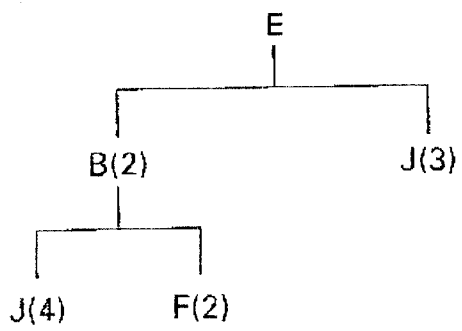
(a) Prepare a material requirements plan for component J. (8%)

(b) Suppose that in week 4 the quantity of E needed is changed from 80 to 70. The planned order releases through week 3 have all been executed. How many more Bs and Js will be on hand in week 6? (8%)