Exam No._____

GANPAT UNIVERSITY
B. Tech. Semester: VIII MechanicalEngineering
Regular Examination May-June 2014
2ME802:Production & Operation Management

Time:3 Hours   Total Marks: 70

Instruction:
1) Answer two sections in separate answer book.
2) Figures to the right indicate full marks of the questions.
3) Draw neat sketch wherever necessary.
4) Assume suitable data if necessary.

Section – I

Q.1   [12]

[A]   List and explain determinants of quality.

[B]   What are the objectives of Production planning and control? Describe the phases of production planning and control.

[C]   What are the main advantages that quantitative techniques for forecasting have over qualitative techniques? What limitations do quantitative techniques have?

OR

Q.1   [12]

[A]   Briefly explain each of these terms:

    1. LTPD   2. Producer's risk
    3. AOQL   4. Consumer's risk

[B]   Explain the term "Standardization" for product development point of view. State the advantages and disadvantages of it.

[C]   Enlist the method of sales forecasting. How do you forecast the sales of a new product?

Q.2   [11]

[A]   Sales of super cool brand of motorbikes are being analyzed. The monthly sales figures   6
for the previous year are furnished below.

month	1	2	3	4	5	6	7	8	9	10	11	12
No. sold (in 100)	8	5	9	11	13	13	10	11	14	15	16	18

 a) Get a 3-month moving average for the various months of the year.

 b) Get a -3 month weighted moving average with weight of : current month 0.5, previous month 0.3 and previous to previous month 0.2

 c) Which method seems give a better fit? You may base your reply upon MAD calculations.

[B]   The Watson electric company produces incandescent light bulbs. The following data on   5
the number of lumens for 40-watt light bulbs are collected.(A_2=0.729 D_3=0, D_4=2.282)

Sample	Observations			
	1	2	3	4
1	604	612	588	600
2	597	601	607	603
3	581	570	585	592
4	620	605	595	588
5	590	614	608	604

a) Construct control charts for mean and range.

b) Since these data were collected, some new employees were hired. A new sample obtained the following readings: 570, 603, 623 and 583. Is this process still in control?

<p style="text-align:center">OR</p>

Q.2 [11]

[A] One of the product groups of a manufacturer of office furniture is desks. The no. of desks sold during the past 10 year is as follows: 6

Year	1	2	3	4	5	6	7	8	9	10
No. of desks	1192	1041	1306	1184	1418	1016	1257	989	1133	1071

Forecast using:

a) Four year moving average for year 5 through 11.

b) Weighted four year moving average in which a weight of 0.1 assigned to first year; 0.2 to second year; 0.3 to third year; 0.4 to fourth year.

c) Using Mean Absolute Deviation(MAD), suggest which technique should be utilized.

[B] An inspector counted the number of defective computer chips in each of 20 samples. Using the following information, construct a control chart that will describe 99.74 percent of the chance variation in the process when the process is in control. Each sample contained 100 chips. Also state your observation. 5

Sample	1	2	3	4	5	6	7	8	9	10
No. of Defectives	14	10	12	13	9	11	10	12	13	10
Sample	11	12	13	14	15	16	17	18	19	20
No. of Defectives	8	12	9	10	11	10	8	12	10	6

Q.3 Answer the following: (Any Three) [12]

[A] Describe briefly the ABC approach in inventory control.

[B] "Value analysis is a remedial process while value engineering is preventive process." Discuss.

[C] The Dine corporation is both a producer and a user of brass couplings. The firm operates 220 days a year and uses the couplings at a steady rate of 50 per day. Couplings can be produced at a rate of 200 per day. Annual storage cost is $ 1 per coupling and machine setup cost is $ 35 per run.

   1. Determine the economic run size

   2. How many numbers of runs per year will there be?

   3. Compute the max inventory level?

   4. Determine the cycle and run time in days.

[D] What factors guide the decision of how much to inspect? Explain in detail.

Q.4 [12]

[A] Define the following terms:
   1. Feasible solution   2. Unbounded solution   3. Infeasible solution
   4. Optimal solution   5. Alternative optimal solution   6. Degenerate solution

[B] Solve the following problem by Simplex method.

$$\text{Max } Z = 3x_1 + 2x_2 + 5x_3$$

subject to $x_1 + x_2 + x_3 \leq 9$

$$2x_1 + 3x_2 + 5x_3 \leq 30$$

$$2x_1 - x_2 - x_3 \leq 8$$

$$x_1, x_2, x_3 \geq 0$$

[C] Consider the following transportation problem involving three sources and four destinations. The cell entries represent the cost of transportation per unit.

	D_1	D_2	D_3	D_4	Source
S_1	3	1	7	4	300
S_2	2	6	5	9	400
S_3	8	3	3	2	500
Destination	250	350	400	200	1200

Find the initial basic feasible solution using Vogel's Approximation method.

OR

Q.4 [12]

[A] Explain various phases of Operation Research.

[B] Use the simplex method to solve the following LP problem.

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints

(i) $2x_1 + 3x_2 \leq 8$ (ii) $2x_2 + 5x_3 \leq 10$ (iii) $3x_1 + 2x_2 + 4x_3 \leq 15$ (iv) $x_1, x_2, x_3 \geq 0$

[C] Consider the transportation problem shown in below table.

	D_1	D_2	D_3	D_4	D_5	Capacity
S_1	10	2	16	14	10	300
S_2	6	18	12	13	16	500
S_3	8	4	14	12	10	825
S_4	14	22	20	8	18	375
Demand	350	400	250	150	400	

Find the initial basic feasible solution using LCM and NWCM.

Q.5 [11]

[A] Five men are available to do five different jobs. From past records the time (hr) that each man takes to do each job is known & given in table:-

Men	Jobs				
	1	2	3	4	5
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

[B] Consider the below table summarizing the details of project involving 11 activities.

Activity	Predecessors	Durations(Weeks)		
		Optimistic time	Most likely time	Pessimistic time
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A,B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E,F	4	4	4
I	E,F	4	4	10
J	D,H	2	5	14
K	I,G	2	2	8

Find the followings
1. Construct the project network.
2. Find the expected duration and variance of each activity.
3. Find the critical path.

<div align="center">OR</div>

Q.5 [11]

[A] A computer center has three expert programmers. The center wants three application programs to be developed. The head of computer center after studying carefully the programs to be developed, estimates the computer time in minutes required by the experts for application programmers follows:- [4]

Programmer	Programs		
	A	B	C
1	120	100	80
2	80	90	110
3	110	140	120

Assign the programmer in such a way that the total computer time is minimum.

[B] The following table gives data on normal time, and cost and crash time, and cost for a project. [7]

Activity	Normal		Crash	
	Time(Weeks)	Cost(Rs)	Time(Weeks)	Cost(Rs)
1-2	3	300	2	400
2-3	3	30	3	30
2-4	7	420	4	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1000	9	1200

Indirect cost is Rs. 50 per week.

Determine the followings.

1. Draw the network diagram for the project and identify the critical path.
2. What are the normal project duration and associated cost?
3. Find out the total float associated with each activity.
4. Crash the relevant activities systematically and determine the optimal project completion time and cost.

Q.6 Answer the following: [12]

[A] Solve the following LP problem using graphical method.

Minimize $Z = 200 x_1 + 400 x_2$

Subject to

$x_1 + 3x_2 \geq 400$

$x_1 + 2x_2 \geq 350$

$x_1, x_2 \geq 0$

[B] A Company manufactures two different types of Products, P1 & P2. Each product requires processing on milling and drilling Machine, but each type of machine has a limited hours available per week. The net profit per unit of products, resource requirements of products and availability of resources are summarized in table below.

A Sample data of product mix Problem

Machine type	Processing time(Hours)		M/C hours available per week
	Product P1	Product P2	
Milling Machine	2	5	200
Drilling Machine	4	2	240
Profit/unit	250	450	

Develop a linear programming model to determine the optimal production volume of each of the products such that profit is maximized subject to availability of machine hours.

[C] A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming poison distribution for arrival rate and exponential distribution for service rate, find

1. Average no. of customers in the system
2. Average no. of customers in the queue or average queue length
3. Average time a customer spends in the system
4. Average time a customer waits before being served.

END OF PAPER