INDIAN INSTITUTE OF MATERIALS MANAGEMENT

June 2011

Post Graduate Diploma in Materials Management

PAPER – 18 C

OPERATIONS RESEARCH.

DATE: 18.06.2011 **Max. Marks: 100**
TIME: 2.00 p.m to 5.00 p.m. **Duration: 03 Hrs.**

Instructions:

1. From part"A", Each sub-question carries 01 marks
2. From"B", answer any 3 out of 5 questions each question carries 16 Marks
3. Part "C" is a compulsory question – 20 Marks.
4. Please read the instruction on the answer sheet.

PART – A **Total :32 Marks**

Q1. State true or false

1. Inventory control checks the wastages on nation's resources such as raw materials, ores, etc.
2. SQC deals with quality related of function of specification production (or) Inspection.
3. Process capabilities don't match the product's requirement with regard to accuracy and repeatability.
4. Business process reengineering is defined as the functional rethinking and radical redesign of business.
5. An economic analysis can be done by using break-even analysis.
6. Rate contract is very used in private sectors.
7. Zero stock purchase system is in-live with using the Just-In-Time manufacturing system.
8. Crest time is the longest possible activity; crashing more than the normal time will decrease the direct cost.

Q2. Fill in the blanks

1. Types of Assignment problems _____ & _____
2. Simulation is best suited _____ and _____.
3. Types of maintenance of facilities _____ maintenance _____ maintenance _____
4. EOQ= $\sqrt{2 \times R \times ? / CH}$
5. Re-order level = _____ X Re-order period
6. Gantt Chart used for _____ purpose
7. Strategic areas of quality control program in _____ & _____
8. Average stock level = ½ {_____ + Maximum level}

Q3.Expand following

(1) PERT (2) FCFS (3) LIFO (4) TPM (5) LPP (6) RFQ (7) VMI (8) SCM.

Q4.Link & connect the following correctly. (Answer's)

1	Perpetual Inventory system	It's as project network is the longest path in the network	**A**
2	Queuing theory	It's Measure of how closely a good or service conforms to specified standard	**B**
3	Advantage of material controls	It's daily stock position should be taken in this system	**C**
4	Critical path	It's deals with problems that involve waiting	**D**
5	Quality	It's Involved cleaning, Inspection, Oiling and re-tightening of the parts.	**E**
6	Preventive maintenance	It's has two elements namely "Improvement/ Changes for the better" and ongoing/ continuity.	**F**
7	Kaizen	It's ensure continuity of supply of raw materials.	**G**
8	Purchasing Function	To increase the storage capacity	**H**

Part-B

Total (3 x 16 =48) Marks

Answer any three from following questions.

Q. 5 (a) Explain the 6 Pillars of TPM. **(4 x 4 = 16)**

(b) A Manufacturing buys costing equipment from outside suppliers Rs.30 per unit Total annual needs are 800 units. The following data is available

- Annual Return on Investment 10%
- Rent, Insurance etc. Per unit per year Re.1
- Cost of placing an order Rs.100

Determine (EOQ) Economic Order quantity.

(c) Solve the game with the pay-off matrix of player A as given

Game Problem

Player B

	B1	B2	B3	
	-4	0	4	A1
Player A	1	4	2	A2
	-1	5	-3	A3

d) Explain the term of "Sensitivity analysis"

Q. 6(a) Project Network Model **(2 x 8 = 16)**

Construct a network for a project whose activities and their predecessor relationship are given here

Activity Sequence for a project.

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor	-	-	-	A	B	B	C	D	E	H,i	F,G

b) Simulation of demand forecasting problem

A dealer sells a particular model of washing machine for which the probability distribution of daily demand is as given in below:

Probability Distribution of Daily Demand.

Demand/day	-	0	1	2	3	4	5
Demand	-	0.05	0.25	0.20	0.25	0.10	0.15

Find the average demand of washing machines per day

Q. 7(a) ABC Analysis (1 x 16 = 16)

The Store of an oil engine repair shop has 10 items whose details are shown in the following Table 1.1. Apply ABC Analysis to the store.

Table 1.1 Details of Store

Component Code	Description	Price/Unit (Rs.)	Units/ Year
C01	Packing Thread	100	100
C02	Tower bolt	200	300
C03	Hexagonal nut	50	700
C04	Bush	300	400
C05	Coupling	500	1000
C06	Bearings (Big)	3000	30
C07	Bearings (Small)	1000	100
C08	Fuel Pump	7000	500
C09	Fixture	5000	105
C10	Drill bit	60	1000

Q. 8 (a) Solve the following LPP BY graphical Method (1 x 10 = 10)

Minimize Z= 18X1 + 12X2

Subject to Constrains,

2X1 + 4X2 ≤ 60 …… (i)

3X1 + X2 ≤ 30 …… (ii)

8X1 + 4X2 ≤ 120 ……(iii)

Where X1 , X2 ≥ 0

(b) What is the objectives of Inventory control and explain the factors affecting minimum stock level? (1 x 6 = 6)

Q. 9(a) Replacement Model (2 x 8 = 16)

The following mortality rates have been observed for a certain type of light bulb.

End of week	1	2	3	4	5	6
Probability of failure to date	0.05	0.20	0.40	0.65	0.85	1.00

There are 1000 bulbs in use and it costs Rs.30 to replace an individual bulb which has burnt out. If all the bulbs were required to be replaced simultaneously, it would cost Rs.12 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?

(b) Draw the flow chat of (Construction or Electrical) project procurement Process and Explain the Project Purchase manager roles & Responsibilities.

Part-C **(20 Marks)**

PERT Model

Consider the following data of a project

Activity	Predecessor(s)	Duration (Weeks)		
		a	m	b
A	-	1	2	3
B	-	2	2	8
C	A	6	7	8
D	B	1	2	3
E	A	1	4	7
F	C,D	1	5	9
G	C,D,E	1	2	3
H	F	1	2	9

(a) Construct the project network.

(b) Find the expected duration and variance of each activity

(c) Find the critical path and the expected project completion time.

(d) What is the probability of completing the project on or before 20 weeks?

(e) If the probability of completing the project is 0.8 find the Expected project completion time.

Note: Value obtained from standard normal table: 0.9382

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