Activity	a	m	b	Immediate Predecessor
A	2	5	8	–
B	1	5	9	–
C	4	6	9	A
D	2	2	2	B
E	1	2	9	A
F	2	4	5	C, D
G	3	8	10	C, E
H	1	2	3	F, G

(a) Calculate the expected time and variance for each activity.   3

(b) Draw the cirtical path diagram. Show the early start, early finish times and late start, late finish times.   3

(c) Show the critical path.   2

(d) What is the probability that the project can be completed in 19 weeks ?   2

Sixth Semester Examination – 2009

PRODUCTION AND OPERATIONS MANAGEMENT

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

1. Answer briefly the followings :   2×10

(a) Which production system will be the most appropriate for a production organization which has very little scope for product variety and produces in large volumes ?

(b) What does the EOQ inventory model attempt to minimize ?

P.T.O.

(c) Which type of manufacturing layout is to be followed for construction of roads ?

(d) Write down any three qualitative techniques applied in forecasting ?

(e) What do you understand by Time-cost model in Project management ?

(f) What is the first step in performing a time study ?

(g) What do you understand by "Quality Circles' ?

(h) Write down any four characteristics of Poka Yoke.

(i) What are the three levels or categories of production planning ?

(j) What do you understand by "Pure Strategy in the context of Aggregate Planning ?

2. (a) A machine makes two types of components C1 and C2, which are then packaged together as the final product (each product sold contains one C1 and one

C2). The machine can work on only one component at a time ; either it can make C1 or it can make C2. There is a setup time when switching from C1 to C2.

At present company wants to make 500 units of C1, then 500 units of C2, then 500 units of C1, then 500 units of C2, and so forth. The setup and run times for each component are given below :

Component	Setup Time	Run time/Unit
C1	7 minutes	0.3 minute
C2	12 minutes	0.2 minute

Assume the packaging of the two components is automated and takes few seconds that can be ignored. What is the average hourly output, in terms of the number of units of packaged product (which includes one C1 and one C2) ?

4

(b) What does the product -process matrix tell us ? where do you place a Mc. Donald's restaurant on the matrix ?   6

3. A time study was made of an existing job to develop new time standard. A worker was observed for 45 minutes. During that period, 30 units are produced. The analyst rated the worker as performing at a 90% performance rate. Allowance in the firm for rest and personal time are 12 percent.

(a) What is the normal time for the task ?

(b) What is the standard time for the task ?

(c) If the worker produced 300 units in an eight hour day, what would be the day's pay if the basic rate was Rs. 6 per hour and the premium payment system paid on a 100 percent basis ? 3+3+4

4. In the table below lists the demand of colour television in the city of Bhubaneswar for a nine month period (January through September).

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept
Demand	110	130	150	170	160	180	140	130	140

(a) Forecast April through September using three-month moving average. 3

(b) Use simple exponential smoothing with alpha = 0.3 to estimate April through September 4

(c) Use MAD to decide which method produced the better forecast over six month period. 3

5. Product X is made of two units of Y and three units of Z. Y is made of one unit of A and two units of B. Z is made of two units of A and four units of C.

Lead time of X is one week, Y is two weeks, Z is three weeks, A is two weeks, B is one week and C is three weeks.

(a) Draw the product structure tree. 3

(b) If 100 units of X are needed in week 10, develop a planning schedule regarding when each item should be ordered and in what quantity ? 7

$D_{t+1} + \alpha (D_{t-1} \ F_{t-1})$

D_{t+1}

6. An assembly line is to operate eight hours per day with a desired output of 240 units per day. The following table contains information on this product's task times and precedence relationships.

TASK	TASK TIME (SEC)	IMMEDIATE PREDECESSOR
A	60	—
B	80	A
C	20	A
D	50	A
E	90	B, C
F	30	C, D
G	30	E, F
H	60	G

(a) Draw the precedence diagram.   2

(b) What is the workstation cycle time ?   3

(c) Balance this line that minimizes the number of workstations subject to cycle time and precedence constraints.   3

(d) What is the efficiency of your line balance and the total idle time ?   2

7. M/s Wipro wants to reduce a large stock of PCs through discount sale. It has offered to IIT Bhubaneswar a discount pricing schedule as per following :

QUANTITY	PRICE
1 – 49	Rs. 14000
50 – 89	Rs. 11000
90 and above	Rs. 9000

The annual carrying cost for the IIT for a PC is Rs. 190 and the ordering cost is Rs. 2500 and the annual demand for this particular model PC is estimated to be 200 units. The IIT Bhubaneswar wants to determine whether it should take advantage of this discount scheme or order as per the EOQ order size.   10

8. A project contains the following activities, along with their time estimates for completion.