

KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks scored:

Level : B.E.

Year : III

Exam Roll No. :

Time: 30 mins.

Course : MEEG 308

Semester : II

F. M. : 20

Registration No.:

Date : 3 DEC 2023

SECTION "A"
[20Q. × 1 = 20 marks]

Mark [x] in the most appropriate answer box.

1. Which one of the following is **CORRECT**?
 Production planning and control functions are extremely complex in
 Job-Production shop producing small number of pieces only once
 Job- Production shop producing small number of pieces intermittently
 Batch Production shop producing a batch only once
 Batch production shop producing a batch at irregular intervals

2. Actual Sales is Rs. 3000. breakeven sales is Rs. 1500 and fixed cost is Rs. 6000. Find the Profit at then Actual Sales.
 Rs. 4,000 Rs.6,000 Rs. 5,500 Rs. 5,000

3. Determine EOQ value when annual demand is worth Rs. 5000, Ordering cost is 2% of the Order Value and holding cost is 10% of the unit price.
 Rs. 14,000 Rs. 6000 Rs. 20,000 Rs. 10,000

4. The scale of car in a showroom in 4 consecutive months 70, 68, 82, 95 respectively with smoothing constant of 0.4. Find the forecast for the next month.

- 80
 90
 83
 93

Month	Sale
1	70
2	68
3	82
4	95

5. The sale of an Automobile company is priced as shown below in the table. Forecast the demand for the next year 2015 using Least squared technique.

- $y = 43.8 + 1.52x, 60.53 \text{ cr}$
 $y = 33.8 + 1.52x, 30.5 \text{ cr}$
 $y = 20 + 1.52x, 60.53 \text{ cr}$
 $y = 20 + 1.52x, 30.5 \text{ cr}$

Year	Sales(cr)
2005	30
2006	33
2007	37
2008	39
2009	42
2010	46
2011	48
2012	50
2013	55
2014	58

6. Consider the following statements:

Exponential smoothing

- I. Is a modification of moving average method?
- II. Is a weighted average of past observations?
- III. Assigns the highest weight age to the most recent observation

Which of the statements given above are **CORRECT**?

- I, II and III I and II only II and III only I and III only

7. In exponential smoothing method, which one of the following is **TRUE**?

- $0 \leq \alpha \leq 1$ and high value of α is used for stable demand
- $0 \leq \alpha \leq 1$ and high value of α is used for unstable demand
- $\alpha \geq 1$ and high value of α is used for stable demand
- $\alpha \leq 0$ and high value of α is used for unstable demand

8. In a time series forecasting model, the demand for five time periods was 10, 13, 15, 18 and 22. A linear regression fit results in an equation $F = 6.9 + 2.9t$ where F is forecast for the period t . The sum of absolute deviation for the live data is _____.

- 3.2 1.3 2.2 4.2

9. Consider the following jobs and their processing times at corresponding machines

Jobs	Duration (hr)		
	Machine I	Machine II	Machine III
A	13	5	9
B	5	3	7
C	6	4	5
D	7	2	6

- B-A-C-D A-C-D-B B-D-C-A A-D-C-B

10. An operations consultant for an automatic car wash wishes to plan for enough capacity of stalls to handle 60 cars per hour. Each car will have a wash time of 3 minutes, but there is to be a 20% allowance for set-up time, delays and payment transactions. How many car wash stalls should be installed? Which one of the following is the preferred logical sequence in the development of a new product?

- 3 4 5 6

11. Which one of the following combinations has the lowest break-even point?

	Fixed Cost (Rs.)	Variable Cost/unit (Rs.)	Revenue/units (Rs.)
a	30,000	10	40
b	40,000	15	40
c	50,000	20	40
d	60,000	30	40

- a b c d

12. The project activities, precedence relationships and duration's are described in the table. The critical path of the project is

Activity	Precedence	Durations
P	-	3
Q	-	4
R	P	5
S	Q	5
T	R,S	7
U	R,S	5
V	T	2
W	U	10

- P-R-T-V Q-S-T-V Q-S-V-W Q-S-U-W

13. There are two products A and B with the following characteristics product demand (in units), order cost (in Rs./order), holding cost (in Rs./unit/years)

A.	100	100	4
B.	400	100	1

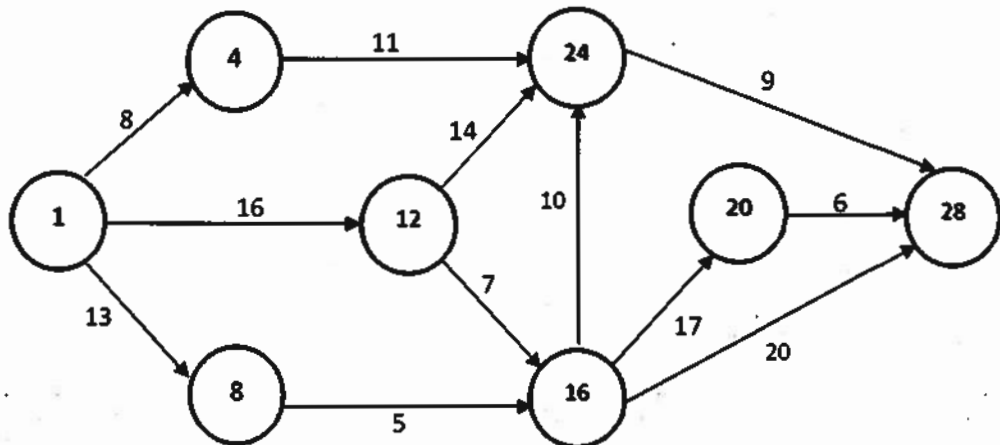
The economic order quantities (EOQ) of product A and B will be in the ratio of:

- 1:1 1:2 1:4 1:8

14. The demand for a component is 10000 pieces per year. The cost per item is Rs. 50 and the interest cost is at 1% per month. The cost associated with placing the order is Rs. 240. What is the EOQ?

- 15.17 times/year 11.17 times/year
 14.17 times/year 16.17 times/year

15. The earliest time of the completion of the last event in the given network in weeks is



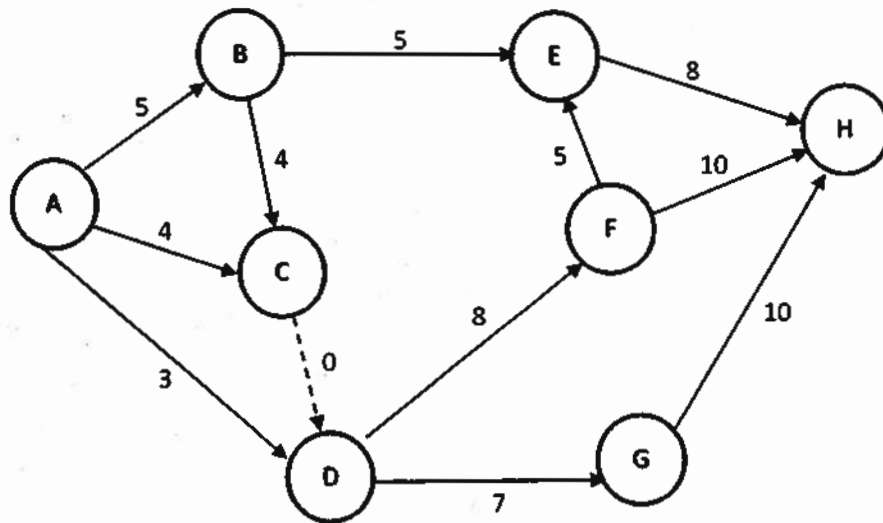
- 41 42 43 46

16. A department works on 8 hours shift, 288 days a year and has the usage data of a machine, as given below. Determine the total processing time needed in hours to produce products A, B and C and also determine the annual capacity of one Machine.

Product	Annual Demand (units)	Processing Time (Standard Time in hours)
A	325	5.0
B	450	4.0
C	550	6.0

- 3225 hrs, 2000 hrs 6725 hrs, 2304 hrs
 3225 hrs, 2300 hrs 6725 hrs, 2000 hrs

17. The time by which the activity completion time can be delayed without affecting the start of succeeding activities is known as
 Duration Total Float Free Float Interfering Float
18. Assertion (A): It is possible to have more than one break-even point in break-even charts
 Reason (R): All variable costs are directly variable with production.
 Both A and R are individually true and R is correct explanation of A
 Both A and R are individually true but R is not the correct explanation of A
 A is true but R is false
 A is false but R is true
19. In which part of the House of Quality "Product Design Characteristics" can be located?
 Customer Requirements Prioritized Customer Requirements
 Technical Descriptors Prioritized Technical Descriptors
20. For the network shown in the given figure, the earliest expected completions time of the project is:



- 26 days 27 days 30 days Indeterminable

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SECTION "B"

Attempt *ALL* questions. Assume suitable data if necessary.

1. Explain in short [5 × 2 = 10]
- Product Design process is a never ending improvement process, explain it.
 - List different stages in Product Lifecycle approach emphasizing on the decisions and major considerations.
 - The number of transistors (in millions) made at a plant Japan during the past 5 years follows:

Year	Transistors
1	140
2	160
3	190
4	200
5	210

- Forecast the number of transistors to be made next year, using linear regression.
 - Compute the Mean Squared Error (MSE) when using linear regression.
- Total Inventory Cost at the order size of 400 units & 900 units are equal. Then determine Economic Order Quantity.
 - A standard machine tool and an automatic machine tool are being compared for the two machines.

	Standard Machine Tool	Automatic Machine Tool
Setup Time	30 min	2 hours
Machining Time per piece	22 min	5 min
Machin Rate	Rs. 200 per hour	Rs. 800 per hour

2. Describe in detail how the link between Product Design and Process Planning is done. And Describe Product-Process Matrix and assert how it helps to understand why and how companies change their Production operations. [5]
3. In a production system, Annual demand is Rs. 800 unit ordering cost is Rs. 1800 and holding cost is 10% of unit price of an inventory. Items can be purchased in a lot as given below. Determine the best order size. [5]

Lot Size	Unit Price
1-999	220
1000-1499	200
1500-1999	190
2000- Above	185

4. The RELIABLE CONSTRUCTION COMPANY has just made the winning bid of \$5.4 million to construct a new plant for a major manufacturer. The manufacturer needs the plant to go into operation within a year. Therefore, the contract includes the following provisions:
- A penalty of \$300,000 if Reliable has not completed construction by the deadline 47 weeks from now.
 - To provide additional incentive for speedy construction, a bonus of \$150,000 will be paid to reliable if the plant is completed within 40 weeks

So to finish the assigned work within the stipulated time period Draw a CPM Network and determine Early Start, Early Finish, Latest Start, Latest Finish and Free Float and Total Float for all the activities to draw a right conclusion. [5]

Activity	Activity Description	Immediate Predecessors	Estimated Duration (Weeks)
A	Excavate	--	2
B	Lay the Foundation	A	4
C	Put up the rough wall	B	10
D	Put up the roof	C	6
E	Install the exterior plumbing	C	4
F	Install the interior plumbing	E	5
G	Put up the exterior siding	D	7
H	Do the exterior painting	E, G	9
I	Do the electrical work	C	7
J	Put the wall board	F, I	8
K	Install the flooring	J	4
L	Do the interior painting	J	5
M	Install the exterior fixtures	H	2
N	Install the interior fixtures	K, L	6

5. A large Portland Manufacturer wants to forecast demand for a piece of pollution control equipment. A review of past sales, as shown below indicates that an increasing trend is present:

Month (t)	Actual Demand (A _t)	Month (t)	Actual Demand (A _t)
1	12	6	21
2	17	7	31
3	20	8	28
4	19	9	36
5	24	10	?

Smoothing constants are assigned the values of $\alpha = 0.2$ and $\beta = 0.4$. The firm assumes the initial forecast for month 1 was 11 units and the trend over the first period is 2 units. [5]

6. Use the graphical method to find the optimal path with minimum elapsed total time of 2 jobs and 5 machines having two different sequences with the below data. [5]

Job 1	Sequence	A	B	C	D	E
	Time	2	4	3	6	6
Job 2	Sequence	B	C	A	D	E
	Time	4	6	3	3	6

7. As per the Case Study "Design for Manufacturing and Assembly" by Peter Dewhurst, University of Rhode Island from Industrial Engineering Handbook by Maynard. [5+5]
- Explain detail about the new approach to Design for Manufacture and Assembly and its role in Product Simplification.
 - Discuss about DFA Index with the redesign of the DFA case study about the Pressure recorder.
8. As per the Case Study "Scheduling and Inventory Control of Manufacturing Systems" from Industrial Engineering Handbook by Maynard [3+5+2]
- Discuss the Explosion based Inventory Systems, outlining the essence of Requirement Planning. And how end items are scheduled to be produced in accordance with Master Schedule.
 - How MRPs (Material Requirement Planning) examine assembly relationships between component parts of an End Item to be produced, emphasize it with generation of MRP table with appropriate example.
 - In very short discuss MRP Lot Sizing Heuristics.

