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ME 181703

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Roll No. of candidate

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2022

TINA CHOWDHURY CENTRAL LIBRARY  
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Azara, Halkhowapara,  
Guwahati, 781017

B.Tech. 7<sup>th</sup> End- Semester Examination

Mechanical Engineering

INDUSTRIAL ENGINEERING AND MANAGEMENT

New Regulation (w.e.f. 2017-18) &

New Syllabus (w.e.f. 2018-19)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct option : (10 × 1 = 10)
- (i) The activity timing of a PERT network follows \_\_\_\_\_ distribution whereas the project completion time follows \_\_\_\_\_ distribution
- (a) Beta, Normal                      (b) Normal, Beta  
(c) Binomial, Normal                (d) Normal, Binomial
- (ii) Pickup the correct statement. Dummy activity on a PERT/CPM chart means, it
- (a) Consumes time, but no resources  
(b) Consumes resources but no time  
(c) Consumes neither time nor resources  
(d) Is a dangling event
- (iii) Work study is concerned with
- (a) Improving present method and finding standard time  
(b) Motivation of workers  
(c) Improving production capability  
(d) Improving production planning and control

[Turn over

- (iv) Which of the following layouts is suited to job production?
- (a) Process layout
  - (b) Product layout
  - (c) Fixed position layout
  - (d) Plant layout
- (v) Performance rating is equal to
- (a) Observed performance + normal performance
  - (b) Observed performance – normal performance
  - (c) Observed performance  $\times$  normal performance
  - (d) None of the above
- (vi) At the break-even point,
- (a) Total cost is more than the sales revenue
  - (b) Total cost is less than the sales revenue
  - (c) Total cost is equal to sales revenue
  - (d) Fixed cost is equal to variable cost
- (vii) The standard time for a job is
- (a) Total work content
  - (b) Base time + relaxation time
  - (c) Total work content + basic time
  - (d) Total work content + delay contingency allowance
- (viii) Quality is defined as
- (a) Fitness for use
  - (b) Conformance to specifications
  - (c) Delight to customer
  - (d) All of these
- (ix) Time study is
- (a) The appraisal, in terms of time, of value work involving human effort
  - (b) Machine setting time
  - (c) Time taken by workers to do a job
  - (d) Method of fixing time for workers

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(x) The Organization in India that deals with standardization is

- (a) ISI (b) ISO  
(c) BIS (d) BOS

2. (a) Define the following terms as used in Inventory Control

- (i) Re-order Point (ii) Ordering Cost  
(iii) Inventory Carrying Cost (iv) Lead time  
(v) Buffer or Safety Stock

(b) What are ABC, FSN and VED analysis? How these three analysis are combined to minimize the no of policies for inventory

(c) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs 50/- per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75/- per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find

- (i) The Economic lot size  
(ii) The Total cost of inventory.

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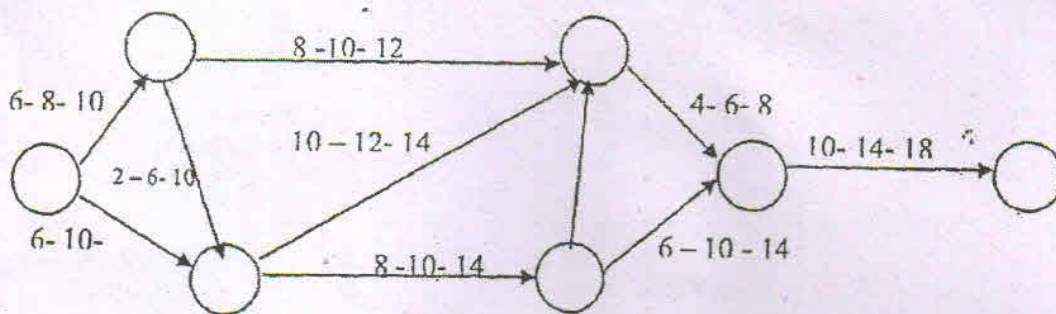
$$((1 \times 5) + (4 \times 2) + (2 \times 2)) = 15$$

3. (a) Define the term 'Project'. Write down two characteristics of a Project.

(b) Define 'path' and 'Critical Path'

(c) Define 'Contractual Obligation time' as used in Project Management.

(d) Consider the following project (all the time estimates are in weeks)



- (i) Calculate the Slack of each event of the network  
(ii) Identify the Critical path  
(iii) Calculate the time of completion of the project  
(iv) Categorize all the activities of the Project into two heads Critical and Non-Critical.

$$((1+2) + (1+1) + 2 + (2+2+2+2)) = 15$$



4. (a) How Plant Layout affects productivity of an Organization? What are different types of Plant Layout?
- (b) An operator is performing thread cutting operation on one end of the shaft using a lathe. The sequences of activities involved are as follows :
- (i) Loading the shaft in the lathe (3 min)
- (ii) Thread cutting (4 min)
- (iii) Unloading the shaft form the lathe (2 min)

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As the operator remains idle for certain period of time during thread cutting, 2 lathes are assigned to one operator. Draw man-machine chart for a minimum of 20 min duration. (3+5)+7=15

5. (a) Consider an example of manufacturing a blade assembly of ceiling fan. Develop an outline process chart with the following components: Blade, fixing plate, 3 pieces of bolt and nut pairs and 6 pieces of washers. Assume the number of operations as per your convenience.
- (b) The desired daily output for an assembly is 360 units. This assembly line will operate 450 min per day. The product's task times and precedence relationships are as

Task	Task time (seconds)	Immediate predecessor
A	30	-
B	35	A
C	30	A
D	35	B
E	15	C
F	65	C
G	40	E, F
H	25	D, G

- (i) Draw the precedence diagram.
- (ii) Find the workstation cycle time.
- (iii) Balance the line using the maximum no. of followers' method
- (iv) Estimate the efficiency of your line balance?

$$(7+(2+2+2+2)=15)$$



6. (a) Identify three most crucial relevant factors you would be considering while selecting the site for setting up a brick manufacturing unit

(b) A plant manufacturing a certain product was operating at 60% of its installed capacity. A buyer offered to purchase 6000 units of its product at Rs. 6/- per unit while the average cost is Rs. 8 given

Total Plant Capacity = 20000 units

Present output = 10000 units

Direct Material Cost = Rs. 20000/-

Direct Labour Cost = Rs. 20000/-

Fixed Cost of the Unit = Rs. 40000/-

Decide whether the offer made by the buyer should be accepted or rejected

(c) Develop a 5 S plan for your study table. Consider the table will consist of books, computer, paper stationery etc.

(3+5+7=15)

7. (a) In a production floor, there are five jobs, each of which must go through the two machines A and B in the order AB. Processing time (hours) is given below:

job	1	2	3	4	5
Machine A	5	1	9	3	10
Machine B	2	6	7	8	4

Determine the sequence for the five jobs will optimize the elapsed time and calculate the Percentage idle time of each of the machines.

(b) Table below shows details of three available alternative locations for setting a cement plant. Which location would you suggest

Factors	Locations		
	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>
Expected initial investment (Lakh of Rs.)	10.2	12.4	15.6
Water (Lakh of Rs.)	1.4	1.6	1.3
Power (Lakh of Rs.)	3.2	5.7	4.5

Factors	Locations		
	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>
Labour (Lakh of Rs.)	1.2	0.9	1.3
Freight (Lakh of Rs.)	0.4	0.7	0.9
Fuel (Lakh of Rs.)	2.2	2.3	4.2
Raw material (Lakh of Rs.)	5.8	8.2	6.5
Taxes (Lakh of Rs.)	0.3	0.3	0.5
Total expected sales (Lakh of Rs.)	28.5	25.6	42.8
Housing facility	Excellent	Good	Poor
Cost of living	Low	Normal	High
Availability of skilled labour	Poor	Poor	Available
Provision for future expansion	Yes	Yes	No
Recreational facilities	Poor	Poor	Good

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(7+8=15)