(3 Hours)   **Total Marks: 80**

N.B. 1) Question No.1 is compulsory.
    2) Attempt any three questions out of the remaining five questions.
    3) Figures to the right indicate full marks.
    4) Assume suitable data wherever required but justify the same.

Q.1 Short Answer questions. (Any Four)   **20**
    a.   Analyzing layouts with computers with the help of CORELAP
    b.   What are the different costs incurred while increasing the value of the product?
    c.   Draw a FAST diagram considering the example of a 'Pen'.
    d.   State the different steps involved in Method Study.
    e.   Illustrate the concept of time value of money with the four variables involved in it.

Q.2 a. Define white productivity. What are the factors influencing Productivity of an Enterprise? **10**

b. What are the steps involved in micro motion study? Describe five therbligs with their symbol, code, colour
   and description.   **10**

Q.3 a. Define the term element. What are the reasons for breaking a job into elements? What are the different
    types of elements?   **10**

   b. What is the importance of plant layout? Explain types of layout with their advantages and disadvantages.
                                                                          10

Q.4 a. Classify the different types of displays and different types of controls with respect to work system design.
                                                                          10

   b. Draw a Two handed process chart considering the example of assembly of 'Nut and Bolt'. **10**

Q.5 a. Define Rating. Why is it necessary to apply rating to the actual time which an operator takes to perform
    an operation?   **10**

b.   An operation involves the following elements given below with their related data,

Element	Observed time (minutes)	Rating	Remarks
A	0.20	90	-
B	0.05	80	-
C	0.03	100	-
D	0.78	100	-
E	0.06	100	-
F	0.05	100	-
G	0.02	85	Once in 5 pieces
H	0.06	80	-
I	0.10	90	-
J	0.04	90	Once in 20 pieces

   Assuming rest and personal allowances as 13% and contingency allowance as 2%, calculate standard time of
   the job.   **10**

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Q.6 a. What do you understand by the term depreciation? What are the inputs required to calculate it? Give at least four different types of depreciation. **10**

Q.6 b. The precedence diagram for assembly activities A to G is shown below. The element times required for the activities are shown in the diagram in minutes. The line operates for 7 hours per day and an output of 550 units per day is desired.
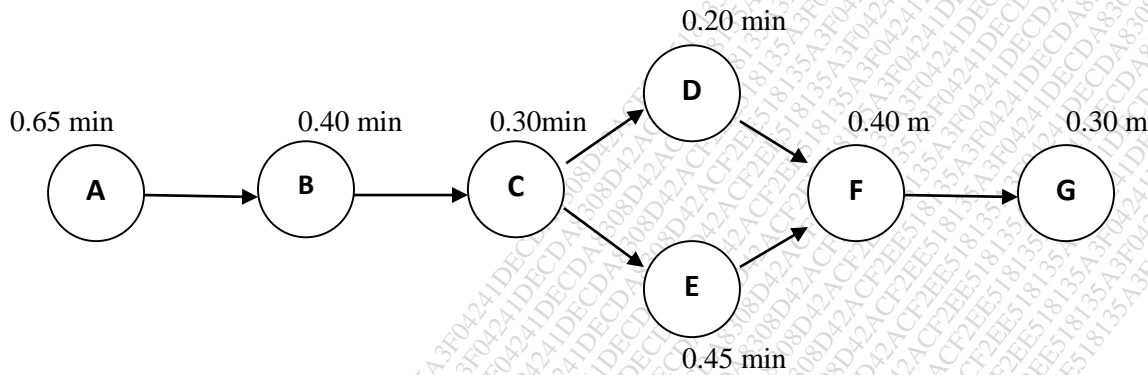
a) Calculate cycle time and theoretical minimum number of workers. **03**
b) Group the task into an appropriate number of work stations. **04**
c) Calculate the balance efficiency. **03**