

11. (a) Discuss significance of average outgoing quality curve. What is AOQL ? How does this limit help in minimizing the acceptance of bad quality items ? 6
- (b) A double sampling plan is as follows. Select sample of 2 from a lot of 20. If both the articles inspected are good accept the lot. If both are defective reject the lot. If one is good and other is defective take a second sample of one article. If article in a second sample is good accept the lot, if it is defective reject the lot. If the lot with 20% defective is submitted. what is probability of acceptance ? 7

**OR**

12. (a) Define TQM. Explain the elements of TQM. 6
- (b) What is 'Quality Audit' ? Name and describe the various types of quality audits. 7

**Faculty of Engineering & Technology**  
**Seventh Semester B.E. (Mech. Engg.) (C.B.S.)**

**Examination**

**INDUSTRIAL ENGINEERING**

Time—Three Hours]

[Maximum Marks—80

**INSTRUCTIONS TO CANDIDATES**

- (1) All questions carry marks as indicated.
- (2) Solve Question No. **1 OR** Questions No. **2**.
- (3) Solve Question No. **3 OR** Questions No. **4**.
- (4) Solve Question No. **5 OR** Questions No. **6**.
- (5) Solve Question No. **7 OR** Questions No. **8**.
- (6) Solve Question No. **9 OR** Questions No. **10**.
- (7) Solve Question No. **11 OR** Questions No. **12**.
- (8) Due credit will be given to neatness and adequate dimensions.
- (9) Assume suitable data wherever necessary.

- (10) Illustrate your answers wherever necessary with the help of neat sketches.
- (11) Use of non programmable calculator is permitted.
1. (a) What is industrial engineering ? Define production, productivity and work study ? 6
- (b) Following information regarding the output produced and inputs consumed for the particular time period for a particular company is given below ?

Output = Rs. 10,000

Human Input = Rs. 3,000

Material Input = Rs. 2,000

Capital Input = Rs. 3,000

Energy Input Rs. 1,000

Other Miscellaneous Input = Rs. 500.

The values are in terms of base year rupee value. Compute various productivity indexes. 7

**OR**

2. (a) What is method study ? What are the objectivity of doing this study ? State its objectives and explain its procedure with considerations. 6
- (b) Draw flow process chart (Material type) for inspection of component ? Also draw flow process chart (Man type) for writing a letter. 7
3. (a) What are allowances in work measurement study ? Explain the various types of allowances in work measurement ? 7
- (b) A work study was conducted in a machine shop. The data has been recorded :
- Total number of observations = 5000
- No activity = 500
- The ratio between manual to machine = 3 : 1 Portion of the activities.
- Average performance rating = 85%
- Total number of pieces produced = 120 during study
- Duration of the study = 60 hrs.
- Calculate the Std time/piece assuming 15% relaxation allowance. 7

**OR**

4. (a) Explain the characteristics and various aspects of man-machine system. 7
- (b) What is anthropometry ? How anthropometric data is used in design ? 7
5. (a) What is time series analysis ? What are the components of time series ? How the forecast is made from the time series. 6
- (b) A company manufacturing washing machines establishes a fact that there is a relationship between sales of washing machines and population of the city. The markets research carried out reveals the following information :

**Popouion (Million)    No. of Washing M/C  
demand ('000)**

5	28
7	40
15	65
22	80
27	96
36	130

Fit a linear regression equation and estimate the demand for washing machines for a city with population of 45 million. 7

**OR**

6. (a) Demand for a part is given below :  
The forecast for April 97 was 100 units. Forecast the demand for July 1997 taking the value of  $\alpha = 0.2$ . 6

Month	April' 97	May' 97	June' 97
Demand	200	50	150

- (b) The demand for the disposable plastic tubing for a general hospital is 300 units and 350 units for Sept and Oct respectively. Using 200 units as the demand for Sept compute the forecast for the month of November. Assume the value of  $\alpha$  as 0.7. 6
7. (a) What is preventive maintenance ? State its objectives. How is it different from predictive maintenance ? 6
- (b) Calculate the reliability of following components if all components are parallel and series :  
 $R_1 = 0.8, R_2 = 0.85, R_3 = 0.65, R_4 = 0.9, R_5 = 0.56, R_6 = r 0.72$ . 7

**OR**

8. (a) Explain Bath tub curve. 6

(b) Product X has a MTBF of 40 hours and has MTTR of 5 hours. Product Y has MTBF 30 hours and MTTR of 2 hours :

- (1) Which product is highly reliable.
  - (2) Which product has a greater maintainability ?
- 7

9. (a) A sub-group of 5 items each are taken from a manufacturing process at a regular interval. A certain quality characteristic is measured and  $\bar{X}$  and R values computed. After 25 subgroups it is found that  $\Sigma\bar{X} = 357.50$  and  $\Sigma R = 8.80$ . If the specification limits are  $14.40 \pm 0.40$  and if the process is in statistical control, what conclusions can you draw about the ability of the process to produce items within specifications ? (for subgroup of 5 items,  $d_2 = 2.326$ ).

7

(b) What is quality control ? What are aims an objectives of quality control ?

7

**OR**

10. (a) Explain quality of design and quality of conformance ?

7

(b) In a manufacturing process the no of defectives found in the Inspection of 15 lots of 100 items are given :

7

Lot No.	Defectives
1	4
2	5
3	4
4	3
5	6
6	5
7	8
8	7
9	9
10	12
11	14
12	2
13	4
14	3
15	5

Determine the control limits for appropriate control chart and state whether the process is in control.