NUS/1267 Third Year B.E.(Prod.) Examination WORK STUDY Paper 3 P 2 [Max.Marks :80 SECTION A

| 1. a) What is produ | ctivity? What is the re | lationship between star | ndard |
|--|--------------------------|---------------------------|----------------------|
| of living and H | Productivity? How the | productivity of industr | y can |
| be increased ? | | | 8 |
| b) What is work s | study? What is the cor | tribution of F.W. Taylo | or and |
| F.B. Gilbreth | in the development of V | Work-Study ? | 6 |
| | (| OR | |
| 2. a) Define work-stu | udy. What is the need | of work study ? | 5 |
| b) What is the imp | portance of human facto | or in the adoptation of y | vork study? 4 |
| c) What is 'basic v | work content? How th | e total time of job is ma | ade up? 5 |
| 3. a) Define 'Method | l Study' What are its ol | ojectives ? | - |
| Explain the proc | edure of Method Study | ν. Αθ΄ | 8 |
| b) Draw the variou | us process chart symbo | ls and explain their mea | aning. 5 |
| , | 0 | | C |
| 4. a) Explain flow pro | ocess chart-material tyr | be with suitable exampl | e. 6 |
| b) List out the vari | ous charts, diagrams ar | nd graphs used for Meth | nod Study. 3 |
| c) Which points sh | ould be considered wh | ile selecting a job for N | lethod Study ?4 |
| 5 a) Explain two hand | ded process chart with | an example | 5 |
| b) Explain the cons | truction uses and draw | backs of string diagran | n 8 |
| b) Explain the cons | | R | 1. 0 |
| 6. a) Explain multiple | -activity chart with exa | mple. | 5 |
| b) Explain construction, uses and draw backs of cyclegraph and travel chart. | | | |
| , - | SECT | ION B | |
| 7. a) Define 'Work-M | leasurement' Explain th | ne procedure of work m | easurement. 6 |
| b) List out various | Work Measurement tec | hniques | 3 |
| c) What is the Mean | ning of qualified worke | er? | |
| How the worker is selected for time-study? | | | |
| | | | |
| 8 a) Discuss the object | ctives of work-measure | ement | 6 |
| b) What is pre-dete | rmined time-standard ? | What are its application | $\cos^2 7$ |
| 9 a) An industrial job | involves five operation | ns and related data is gi | ven below 8 |
| Assuming Rest a | nd personal allowances | s as 10% and contingen | cies as 2% |
| of the basic time | Find standard time fo | r completing the job | 0105 45 270 |
| Operation Number | Observed Time | Standard Rating (0 - | Remarks if any |
| Operation Number | (Min) | | Remarks II dify |
| 1 | (101111.) | 85 | |
| 2 | 0.20 | 05 | - |
| <u>2</u> 2 | 0.32 | 95 | - |
| <u> </u> | 0.20 | <u> </u> | - |
| 4 | 0.35 | 100 | - |
| 5 | 3.05 | 80 | Observed time is for |
| | | | transporting 5 jobs |

| b) List out the equipments required for time study.c) What are the applications of time study ? | 2 4 |
|--|--------|
| OR 10. a) Explain the procedure of stop watch time study. b) Define :- | 7 |
| ii) Basic time. | 2 |
| c) What are allowances? What are different types of allowances? Explain any one | 5 |
| 11. a) Why training is needed to personnel while introducing work study ? b) What are incentives ? Explain following wage incentive plans. i) Halsey plan. | 6 |
| ii) Roman plan | 7 |
| 12. a) Explain the steps involved in developing standard data. | 7 |
| | |

N-045

Third Year B. E. (Prod) Examination WORK STUDY Paper : 3 – P – 2 Section : A & B Max. Marks : 80

SECTION – A

| 1. | A) Good relations must be established before work-study | |
|----------|---|-------------|
| | is conducted. Explain. | 7 |
| | B) How productivity of material can be increased through | |
| | saving at various stages of production. | 7 |
| | OR | |
| 2. | A) What do you mean by basic work content? How ineffective | |
| | time is added due to worker ? | 7 |
| | B) Why workers oppose the application of work study in industry ? | 7 |
| 3. | A) Name various process charts used in 'Method-Study' and explain | |
| | any one of them in detail. | 7 |
| | B) Explain the following : | 6 |
| | i) Flow diagram | |
| | ii) Travel chart | |
| | OR | |
| 4. | A) 'Critical examination is the crux of method study'. | 7 |
| | | |
| | Discuss. | |
| | Discuss. B) Discuss the factors to be considered while selecting the work for | |
| | Discuss.B) Discuss the factors to be considered while selecting the work for method – study. | 6 |
| 5. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. | 6 7 |
| 5. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. B) What is 'Memomotion' study ? State its application with example. | 6 7 6 |
| 5. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. B) What is 'Memomotion' study ? State its application with example. OR | 6 7 6 |
| 5. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. B) What is 'Memomotion' study ? State its application with example. OR A) What are 'Therbligs'? Define and draw following therbligs. | 6 7 6 |
| 5. 6. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. B) What is 'Memomotion' study ? State its application with example. OR A) What are 'Therbligs'? Define and draw following therbligs. a) Assembly | 6 7 6 |
| 5. 6. | Discuss. B) Discuss the factors to be considered while selecting the work for method – study. A) What is SIMO chart ? Explain with an example. B) What is 'Memomotion' study ? State its application with example. B) What are 'Therbligs'? Define and draw following therbligs. i) Assembly ii) Inspect iii) Plan | 6 7 6 |

SECTION – B

| 7. | A) Define 'Work-measurement.' Explain the various techniques | |
|----|--|------|
| | of work-measurements. | 7 |
| | B) What is pre-determined time-standard ? What are its applications ? | 6 |
| | OR | |
| 8. | A) Discuss the objective of work-measurement. | 6 |
| | B) What do you mean by 'Standard data'? State its application with | |
| | suitable example. | 7 |
| 9. | A) Explain the steps in making stop-watch time study. | 7 |
| | B) What are the reasons for breaking the jobs into elements in time-stud | y? 7 |
| | OR | |

 A) An industrial job involves three operations and related data is given below. Assuming rest and personnel allowances as 10 % and contingencies as 2 % of basic time. Find standard time for completing job.

| Operation No. | Observed Time | Standard rating |
|---------------|---------------|-----------------|
| | (min) | (0-100) |
| 1 | 0.32 | 85 |
| 2 | 0.35 | 95 |
| 3 | 2.10 | 80 |

- B) What are applications of Time-study ?
- 11. A) What are the problems in increasing productivity through work study ? 6
 - B) What are incentives ? Explain following wage incentive plans.
 - i) Halsey plan
 - ii) Rowan plan

OR

- 12. A) Explain the steps involved in developing standard data.
- 7

6

7

8

- B) What are the steps to be taken to increase the productivity.

NVD / 1284

Third Year B. E. (Production Engg.) Examination WORK STUDY Paper 3 P2 Max. Marks : 80

SECTION – A

| 1. | a) What is work study ? Explain its need and scope of applications.b) Define Productivity. Discuss the factors responsible for reducing Productivity. | 6 7 |
|----|---|--------|
| | OR | |
| 2. | a) The attitude of the supervisor must be won before work study is conducted. Why ?b) What do you mean by basic work content ? How ineffective time is added due to workers ? | 6 7 |
| 3. | a) Discuss the factors to be considered while selecting the work for method study.b) Name the various process charts used in Method study and explain any one of them in detail. | 3 5 |
| | OR | |
| 4. | a) Define Method study. Explain in detail the various steps involved in systematic methods of improvement. b) Explain the following :- Flow diagram. Travel chart. | 7 |
| 5. | a) Discuss principles of motion economy as applied to human body.b) Define method study. Explain in detail the various steps involved | 5 |
| | in systematic methods of improvement.c) What is chronocyclegraph ? | 6 3 |

| a) Explain the term templates and models with their | |
|--|--|
| advantages and disadvantages. | 6 |
| b) What is memomotion study? State its applications. | 3 |
| c) What is SIMO chart? Explain with an example. | 5 |
| | a) Explain the term templates and models with their advantages and disadvantages.b) What is memomotion study ? State its applications.c) What is SIMO chart ? Explain with an example. |

SECTION – B

| | SECTION – B | |
|-----|---|--------|
| 7. | a) Define work Measurement. Explain is brief the procedure | |
| | of work measurement. | 5 |
| | b) State the applications of standard data. | 3 |
| | c) 'Management is responsible for the stoppages and the breakdowns. | |
| | This can be found our with the help of work measurement. Explain. | 5 |
| | OR | |
| 0 | a) What are the applications of work measurement? | 5 |
| 0. | a) what are the applications of work measurement <i>i</i> . | 2 0 |
| | b) Emist the techniques of work measurement with short explanation. | 0 |
| 9. | a) What are the reason for breaking the job into elements in time study ? | 5 |
| | b) An industrial job involves three operations and the related data is | |
| | given below. Assuming Rest and personal allowances as | |
| | 10% and contingencies as 2% of the basis time find the standard | |
| | time for completing the job. | |
| | Operation No. Observed Time Standard Rating | |
| | (min.) (0-100) | |
| | 1 0.32 85 | |
| | 2 0.35 95 | |
| | 3 2.10 80 | 5 |
| | c) What are the applications of time study ? | 3 |
| | OR | |
| | | |
| 10. | a) Discuss the steps involved in the procedure of stop watch time-study. | 6 |
| | b) What is performance rating? Explain various systems of rating. | 7 |
| | | |
| 11. | a) What is work sampling and how it works in Industries? | 5 |
| | b) What are the problems in increasing productivity through work study? | 5 |
| | c) What are incentives? List out the objectives of a sound wage incentive | •. |
| | plan. | 4 |
| | OR | |
| 12. | a) A work sampling study was conducted for 100 hours in the machine | |
| | shop in order to estimate the standard time. The total number of | |
| | observations recorded were 2500. No working activity could be | |
| | noticed for 400 observations. The ratio between manual and machine | |
| | elements was 2:1. Average rating factor was estimated as 1.20 and | |
| | the total number of articles produced during the study period were | |
| | Rest and personal allowances may be taken as 12% of the | |
| | normal time. Find the standard time. | 4 |
| | b) Explain the steps involved in developing standard data. | 4 |
| | c) What steps can be taken to increase the productivity ? | 3 |
| | | |

DVW – 1182 Faculty of Engineering & Technology Third Year B.E.(Production Engg.) Examination WORK STUDY Paper : 3 P 2 Sections A & B Maximum Marks :80

SECTION A

| 1. | (a) What is 'Work study'? Write in brief the basic | 7 |
|----|--|----|
| | procedure of work study. | 1 |
| | (b) How is the total time of a job made up? | 6 |
| | OR | |
| 2. | (a) What is productivity ? What are the factors | |
| | affecting productivity ? | 7 |
| | (b) How can the work content be reduced due to the \square | |
| | process and the methods ? | 6 |
| | | |
| 3. | Define the method study and discuss the following tools | |
| | used for the purpose : | 13 |
| | (i) Operation Process Chart. | |
| | (ii) Flow diagram | |
| | (iii) Travel Chart | |
| | (iv) String diagram | |
| | OR | |
| 4. | (a) Explain the procedure of method study. | 7 |
| | (b) How do flow process chart symbols differ from | |
| | those used for two handed process chart? | 6 |
| | unose used for two hundre process chart. | Ū |
| 5 | (a) What is SIMO chart ? Explain with an example | 8 |
| 5. | (a) What is Shiro chart : Explain with an example. (b) Distinguish between memomotion | 0 |
| | and micromotion study | 6 |
| | | 0 |
| 6 | (a) What are avalagraphs and abranagyalagraphs? | 6 |
| 0. | (a) what are cyclegraphs and chronocyclegraphs ? | 0 |
| | (b) Snow with the help of two-nanded process chart, | |
| | now productivity can be improved by resequencing | 0 |
| | the activities of certain operation. | 8 |
| | SECTION B | |
| 7 | | |
| 1. | (a) what is work measurement? Explain its | |

| 7. | (a) What is 'Work measurement'? Explain its | |
|----|--|---|
| | relationship with 'Method study'. | 7 |
| | (b) Discuss various application s of 'Work measurement'. | 6 |
| | | |

| 8. | (a) 'Management is responsible for the stoppages and the breakdowns.' This can be found out | |
|-----|--|-----|
| | with the help of work measurement. Explain. | 5 |
| | (b) Enlist the techniques of work measurement with | |
| | short explanation. | 8 |
| 9. | Discuss the procedure for timing each element by stop | |
| | watch in detail. | 13 |
| | OR | |
| 10. | (a) What is performance rating? Why it is necessary? | |
| | Discuss various systems of rating. | 8 |
| | (b) Why it is necessary to break down the job into | |
| | elements ? | 5 |
| 11. | (a) Explain the steps involved in developing standard data | . 5 |
| | (b) Define the term Work Sampling. What are its applications? | 5 |
| | (c) List out the objectives of a sound wage incentive plan | 4 |
| | OR | • |
| | | |

12. A work sampling study was conducted for 100 hrs.in the machine shop in order to estimate the standard time. The total number of observations recorded were 3000. Number of working activity could be noticed for 450 observations. The ratio between manual and machine elements was 2:1. Average rating factor was estimated as 1:15 and the total number of articles produced during the study period were 7,000. Rest and Personal allowances may be taken as 12% of the normal time. -- the *** Find Standard time.

14

STD-1109 Faculty of Engineering & Technology Third Year B.E. (Production Engg.) Examination WORK STUDY Paper 3 P 2 Sections A & B Maximum Marks – 80

SECTION A

| 1. | (a) Define Work Study. What is the contribution | - |
|----|--|---|
| | of F.W. IAYLOR to work study ? | / |
| | (b) How work study is useful for Management, Labour Society and Industrial Productivity 2 | 7 |
| | | / |
| 2 | (a) Define Productivity Discuss the factors | |
| 2. | responsible for reducing Productivity. | 7 |
| | (b) What are the problems likely to be encountered $\int V$ | |
| | in implementation of work study? How should | |
| | they be dealt with ? | 7 |
| 3. | (a) Name the various process charts used in Method Study | |
| | and explain any one of them in details. | 6 |
| | (b) Define Method Study. Explain in detail the various | _ |
| | steps involved in systematic methods of improvement. | 7 |
| | OR CLASSIC CLASSIC CLASSIC | |
| 4. | (a) Define Process Charts. What are the symbols used to | 6 |
| | (b) Propers a sutting process short of making a Devetail | 0 |
| | (b) Prepare a outline process chart of making a Dovetan | 7 |
| 5 | (a) Describe cyclograph and chronocyclograph and explain | / |
| 5. | their use with a neat sketch | 6 |
| | (b) List various principles of Motion Economy as applicable | Ũ |
| | to the use of Human body. | 7 |
| | OR | |
| 6. | (a) What are the techniques of Micromotion study ? | |
| | Give the list of various Micromotion study Equipment. | 7 |
| | (b) What is a string diagram? Draw a string diagram of a | |
| | work of your choice. | 6 |
| _ | SECTION B | |
| 7. | (a) Assuming that the total observed time for an operation | |
| | of assembling an Electronic Switch is 1.00 minute. | |
| | If the rating 120% find the normal time. If the | |
| | determine the standard time | 5 |
| | (b) Define Work Measurement and what are the fundamental | 3 |
| | concepts of work measurement | 8 |
| | concepts of work measurement. | 0 |

| 8. | (a) What are the various systems in use of P.T.S. ? | |
|-----|---|---|
| | Explain one most popular amongst them. | 9 |
| | (b) What do you mean by Qualified Worker? | 4 |
| 9. | (a) Give brief accounts of all the main Rating systems. | 7 |
| | (b) What is elemental breakdown in time study? | |
| | Give its advantages. | 7 |
| | OR | |
| 10. | (a) Discuss the various factors which are taken into | |
| | consideration while selecting an operator for time study. | 5 |
| | (b) Explain the following terms :- | |
| | Rating | |
| | Fatigue allowance | |
| | Standard time. 9 | |
| 11. | (a) Give the salient features of sampling procedure in work sampling. (b) A work sampling study showed that 20% of a work, week of 48 hours was consumed by available delays. If each time a work sampling observation was made, the operator was rated and the average of such ratings was 110%. If 100 units were produced by the operator in that period, calculate the standard time. OR | 7 |
| 12. | (a) What is work sampling and how it works in Industries ? | 8 |
| | (b) Enumerate the uses and limitations of work sampling. | 5 |
| | | |
| | | |

GOV-894/VMT-7868 WORK STUDY

| | SECTION – A | |
|----|---|---|
| 1. | (a) Increased productivity lead to higher standard of living. Justify. | 5 |
| | (b) Define Ineffective time. | 2 |
| | (c) Which are the factors reducing productivity ? OR | 6 |
| 2. | (a) What is work study? What is the contribution of F.W. | |
| | Taylor to work study ? | 7 |
| | (b) Explain the procedure for work study ? | _ |
| | What are the advantage of work study ? | 6 |
| 3. | (a) Define method study. What are the objectives of method | 0 |
| | study of the procedure for carrying out method study? | 8 |
| | (b) Name the various process chart used in method study and | 5 |
| | op | 3 |
| 1 | (a) Which factors are to be considered while selecting the work | |
| ч. | for method study ? | 5 |
| | (b) Explain the principle of motion economy as applied to Human body | 5 |
| | (c) Explain material flow process chart with suitable example. | 3 |
| | | |
| 5. | (a) Define multiple activity chart. Explain it with a suitable example. | 5 |
| | (b) Define and explain 'Simo-chart'. | 4 |
| | (c) Distinguish between memomotion and micromotion study. OR | 4 |
| 6. | (a) Define and explain cycle-graph with neat sketch. | 3 |
| | (b) Explain the steps involved in the process of micromotion study. | 5 |
| | (c) Define and draw symbols of following therbligs :- | |
| | (1) Unavoidable delay | |
| | (ii) Transport loaded | |
| | (111) Plan (iv) Dest | |
| | (\mathbf{N}) Kest (\mathbf{N}) Assemble | |
| | (v) Assemble (vi) Find | 5 |
| | SECTION B | 5 |
| 7. | (a) In an eight-hour day it was found that the normal time was | |
| | 400 minutes. Assuming that the remaining time is meant | |
| | for rest and personal needs. Determine the standard time/article, | |
| | if the normal time/article is 1.5 min. Also find the no. of articles | |
| | produced/day. | 5 |
| | (b) Define allowances. Explain : | |
| | Personal and Rest Allowance | |
| | Special Allowance. 5 | 2 |
| | (c) what do you mean by a Qualified worker? | 3 |

| 8. | (a) Define work measurement. What is the procedure | (|
|-----|--|--------|
| | for work measurement ? | 6 |
| | (b) Assume you are the Supervisor. Work measurement | |
| | avalain to your mon the technique of work measurement | |
| | and how it might offeat them 2 | 7 |
| 0 | (a) Describe the advantages and disadvantages of both | / |
| 9. | (a) Describe the advantages and disadvantages of both | 6 |
| | (b) How stondard time is coloulated 2 | 2 |
| | (b) How standard time is calculated ? | 3 1 |
| | (c) what is Kating in time study ? why is it done ? | 4 |
| 10 | (a) What are the techniques of work measurement? | |
| 10. | (a) what are the techniques of work measurement ? | 7 |
| | (b) What is the number of work measurement 2 | / |
| | (b) what is the purpose of work measurement ? | 6 |
| 11 | (a) How the sample size is decided 2 | 2 |
| 11. | (a) How the sample size is decided ? (b) Define Standard Data, How is the standard data dayaloned ? | 5 |
| | (b) Define Standard Data. How is the standard data developed ? | 1 |
| | (c) what are the minitations of work sampling ? | 4 |
| 12 | (a) How activity compling can be used to determine the | |
| 12. | (a) flow activity sampling can be used to determine the | |
| | shop 2. How would you use their information 2 | 6 |
| | (b) Define incentives. What are the characteristics of a good | 0 |
| | (b) Define incentives. What are the characteristics of a good | 1 |
| | (c) Explain the HAI SEV wage incentive plan | 4 |
| | (c) Explain the HALSET wage meentive plan. | 5 |
| | * * * | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

VSH-674/MHR-5424 WORK STUDY

SECTION A

| 1. | (a) | "Work study is one of the most pertaining tool of investigation available to the Management." Explain | 5 |
|----|------------|---|---|
| | (b) | "Good relation must be established before work study | 5 |
| | (c) | What do you understand by productivity of materials ? | 2 |
| 2. | (a) | Describe Frank Gilbreth contribution to the development of work study. | 6 |
| | (b) | Explain in brief concept of productivity. | 7 |
| 3. | (a) | What is method study ? How will you determine the areas that need method study | |
| | (b) | application in an industry ? What is the difference between flow process chart | 7 |
| | | and Two handed process chart ? Draw flow chart for the activity of cleaning the spark plug of a motorcycle. OR | 6 |
| 4. | (a) (b) | Explain Two handed process chart with suitable example. Explain the principles of motion economy as applied to | 4 |
| | | Human body. | 6 |
| | (c) | What are the different types of flow process chart ? | 3 |
| 5. | (a) | Define Travel Chart? Explain the procedure | 6 |
| | (b) | What is chronocyclegraph ? | 2 |
| | (c) | Define Therblig's ? How will you show the following therblig's:- (i) Assemble (ii) Rest | 5 |
| | | (iii) Inspect | |
| | | (iv) Plan (v) Hold | |
| | | | |

OR

6. (a) In a manufacturing unit two handed process chart is prepared for 'clamping the job on m/c' which is as follows :

| Left Hand | I.H. | R.H. | Right Hand |
|-------------|--------|--------|-----------------------|
| Description | Symbol | Symbol | Description |
| To W/P | → | D | Idle on m/c |
| Grasp W/P | Q | D | Idle on m/c |
| To Machine | × | D | Idle on m/c |
| Release W/P | Ο | D | Idle on m/c |
| Idle | D | 0 | Place W/P in position |

| Idle | D | 0 | Turu Handle to clamp |
|----------------|---|---|----------------------|
| To m/c | | D | Idle to m/c |
| Strait m/c | 0 | D | Idle to m/c |
| To m/c | | D | Idle on m/c |
| Stop m/c | 0 | D | Idle on m/c |
| Turn Handle to | 0 | D | Idle on m/c |
| unclamp | | | |
| Push away job | 0 | D | Idle on m/c |

| Suggest an improved method for the activity based on data | |
|---|---|
| obtained from the above chart, so that the motion of both the hands | 7 |

(b) What is Flow Diagram ? Illustrate it with a suitable example. 6

SECTION B

| 7. | (a) | Define work measurement. What are the various techniques | |
|-----|-----|---|-----|
| | | used for work measurement? Explain any one in detail. | 7 |
| | (b) | What is predetermined time standards ? | |
| | | What are its advantage and where is it used? | 6 |
| | | OR | |
| 8. | (a) | What are the objective of work measurement? | 4 |
| | (b) | Define Rating. Explain : | |
| | | (i) Synthetic Rating. | |
| | | (ii) Objective Rating. | 5 |
| | (c) | What are the uses of Standard Data ? | 4 |
| 9. | (a) | What is time study? Which equipments are used for | |
| | | carrying out time study? | 5 |
| | (b) | What are the steps involved in making a time study? | 5 |
| | (c) | Can the time study be carried out on any worker? | 3 |
| | (-) | OR | - |
| 10. | (a) | What different allowances are provided to arrive at standard time | ? 4 |
| | (b) | Define rating. Why is it necessary? Explain the various rating | |
| | (0) | techniques in detail. | 9 |
| | | T (1) | - |
| 11. | (a) | What do you know by work sampling? What are its applications | s?6 |
| | (b) | Explain the following wage incentive plan :- | |
| | | (i) ROWAN Plan | |
| | | (ii) HALSEY Plan | |
| | | OR | |
| 12. | (a) | Define 'Activity Sampling'. | 2 |
| | (b) | Define 'Standard data'. Also give its application. | 5 |
| | (c) | "Incentives are necessary for smooth and efficient | |
| | | running of a factory." Discuss. | 6 |
| | | | |

NUS/1278 Third Year B.E. (Production Engg.) Examination

METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | (a) | What are fits ? Explain in brief the following types of fits. How they can be achieved ? (i) Selective fit (ii) Push fit (iii) Driving fit | |
|----|------|---|----|
| | | (iv) Forced fit(v) Shrinkage fit | 10 |
| | (b) | A limit gauge is required to check the hole 50 H8. The length of the hole is 100 mm. Neglecting the guage tolerance and wear allowance, show the GO and NO GO limit gauges for checking hole as per IS : 919. Given : IT 8 for basic size | |
| | | 50 mm = 39 microns. | 4 |
| 2. | (a) | Why is it necessary to give a tolerance on an engineering dimension? Give examples of various types of tolerances. | 7 |
| | (b) | Explain what do you understand by 'an end standard' and 'a line standard'. Sketch and describe international prototype meter and state under which of the above categories this falls. Also discus its disadvantages. | 7 |
| 3. | (a) | Explain the principles of pneumatic gauging by the 'back pressure' system. Why is it not used over entire range of pressure ? | 7 |
| | (b) | What are the measures of an angle? Describe and sketch the principles of clinometer. OR | 6 |
| 4. | (a) | Compare mechanical, comparator and optical comparator. Describe the working of mechanical optical comparator. | 6 |
| | What | is 'best-size wire'? How will you measure effective diameter of external thread using 'best-size wire? | 7 |

| 5. | (a) | How will you 'Tool – Maker | check small t 's Microscop | hreads using e'? Explain. | | 7 | |
|----|--|---|-------------------------------|------------------------------|----------------|---|--|
| | Expla Ra V | ain the following alue | in relation to | surface texture. | | | |
| | Samp | oling length | | | <i>c</i> | | |
| | Lay | | | 0 D | 6 | | |
| r | () | F 1 · · · 1 / | .1.4 1. | OR | | | |
| 6. | (a) | instrument. 'M | lecrin'. | ig of mechanical rough | ness | 6 | |
| | Discu | uss about various | errors in gea | r. | | | |
| | | How will you | check compo | site errors in a spur gea | ar? | 7 | |
| _ | | **** | | SECTION B | | | |
| 7. | (a) | What do you u | nderstand by | cost of quality and val | ue of quality? | - | |
| | (1) | How to balanc | e them ? | 1.1 | | | |
| | (b) | State and expla | ain the respon | OR | Manager. | 6 | |
| 8. | (a) | Explain the steps in quality control programmes. | | | | | |
| | What are the benefits of statistical quality control ? | | | | | | |
| | (b) | What is 'Proce | ess capability | ? Explain three possi | ble | | |
| | | relationships t | petween proce | ess capability and spec | ification | - | |
| | | limits of the d | imension of t | he workpiece. | | 1 | |
| 0 | (\mathbf{a}) | What do you u | ndorstand by | "Statistical control of | | | |
| 9. | (a) | (a) what do you understand by Statistical control of production processes"? | | | | | |
| | | production pro | 1005505 ! | | | 0 | |
| | (b) | Number of def | ècts (non – c | onformities) recorded | | | |
| | (-) | for 10 lots containing different number of units | | | | | |
| | | are recorded be | elow : | | | 8 | |
| | | | | | | | |
| | | Lot | Unit | Non-Conformities | | | |
| | | 1 | 46 | 118 | | | |
| | | 2 | 43 | 96 | | | |
| | | 3 | 49 | 125 | | | |
| | | 4 | 45 | 87 | | | |
| | | 5 | 45 | 99 | | | |
| | | 6 | 47 | 123 | | | |
| | | 7 | 44 | 104 | | | |
| | | 8 | 46 | 123 | | | |
| | | 9 | 45 | 112 | | | |
| | | 10 | 42 | 98 | | | |

Construct appropriate control chart and comment about the process.

10. (a) Sample of 5 were taken at regular intervals from a process. 10 samples in all being taken. The results were as follows :

| Sample No | | Measu | rement Per S | Sample | |
|-----------|-----|-------|---------------|--------|-----|
| | | (hund | redths of one | e mm) | |
| 1 | 747 | 748 | 747 | 749 | 748 |
| 2 | 748 | 749 | 750 | 748 | 749 |
| 3 | 749 | 748 | 750 | 748 | 749 |
| 4 | 749 | 749 | 750 | 750 | 751 |
| 5 | 749 | 749 | 750 | 750 | 751 |
| 6 | 749 | 750 | 751 | 749 | 750 |
| 7 | 750 | 750 | 751 | 751 | 750 |
| 8 | 751 | 750 | 750 | 750 | 752 |
| 9 | 751 | 751 | 752 | 751 | 751 |
| 10 | 751 | 752 | 752 | 753 | 751 |
| | | | | A. | |

| | Cons | truct \overline{X} and R charts and interpret the charts. | |
|-----|-------|---|---|
| | Give | n : For Sample Size 5, $A_2 = 0.577$. | |
| | | $D_4 = 2.115, D_3 = 0$ | 8 |
| | (b) C | ompare attribute charts and variable charts, used in SQC. | 6 |
| 11 | (a) | What is operating characteristic (o.c.) curve ? | |
| | | Discuss in detail the characteristics of o.c.curve. | 8 |
| | (b) | Explain multiple sampling planes. | 5 |
| | | OR | |
| 12. | (a) | Discuss the interest of the consumer and the producer | |
| | | in the selection of sampling plans. | 7 |
| | Diffe | rentiate between single sampling plan and double | |
| | | sampling plan. | 6 |
| | | | |

SNP – 909/TWA-5836 METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | (a) | State and explain the four grades of standards | |
|----|-------|---|-----------|
| | | depending upon the importance of standard. | 5 |
| | (b) | What is meant by the term "flatness" as applied to | |
| | | metrology? | 2 |
| | Deter | rmine the tolerances on the hole and the shaft | |
| | | for a precision running fit designated by 50 H_7g_6 . | |
| | | You may use the following aid for solving the | |
| | | problem or use IS 919 for convenience :- | |
| | | (i) 50 mm lies between the range 30-50 mm. | |
| | | (ii) $i = 0.45 \sqrt{\frac{3}{D}} + 0.001 D \text{ (microns)}$ | |
| | | (ii) Fundamental deviation for a shaft | |
| | | (iii) Fundamental deviation for g shart $a shaft = 2.5 D^{0.34}$ | |
| | | (iv) IT $6 = 10$ i | |
| | | IT 0 = 101 IT 7 = 16 i | |
| | | State the actual maximum and minimum sizes | |
| | | of the both hole and shaft and maximum and minimum | |
| | | clearances. | 6 |
| | | OR | |
| 2. | (a) | Calculate the following quantities :- | 6 |
| | | (i) Wavelengths of the orange radiations of krypton 86 in a | n inch. |
| | | (ii) Position of the supports from the end of a bar of | f 800 mm, |
| | | considering the minimum central deflection. | |
| | | (iii) Same as (ii) but considering Airy points. | |
| | (b) | Give the detailed classification of plain gauges. | |
| | | Explain each briefly. | 5 |
| | (c) | What are the necessary conditions for interference of light wave | es?2 |
| 3. | (a) | Describe the essential characteristics of comparator. | 3 |
| | (b) | Distinguish between Comparator and Gauges. | 3 |
| | (c) | Show by means of a sketch; the design of a sine bar, and state | |
| | | without quoting values, the features of sine bar which have | |
| | | tolerances for accuracy. | 4 |
| | (d) | Give the design principle i.e. Taylor's principle of thread | |
| | | gauge design. | 3 |
| | | OR | |
| 4. | (a) | Describe with neat sketch the construction and working | |
| | | of a solex pneumatic comparator. | 7 |
| | (b) | How the effective diameter of a screw thread is measured ? | 6 |

| 5. | (a) | What are the different elements those required to check the accuracy of the Gear? Explain the method of Lead and | |
|----|-----|--|----|
| | | tooth thickness measurement. | 7 |
| | (b) | Explain with the help of neat sketches principle and | |
| | | construction of an Autocollimator (i.e. Injected graticule | |
| | | autocollimator). | 7 |
| | | OR | |
| 6. | (a) | Explain the concept "Flatness". How it is indicated ? | 4 |
| | (b) | What are the reasons for controlling surface texture ? | 3 |
| | (c) | Explain what is meant by the 'lay' of a machined | |
| | | surface, and with the simple diagrams show the | |
| | | direction of lay for each of the following operation : | |
| | | (i) Facing at a capstan lathe; | |
| | | (ii) Grinding a flat surface at a surface grinding machine. | |
| | | (iii) Milling a flat surface using an inserted tooth face | |
| | | milling cutter. | 7 |
| | | SECTION B | |
| 7. | (a) | Explain the following terms in respect of quality :- | |
| | | (a) Product Feature | |
| | | (b) Customer | |
| | | (c) Grade | |
| | | (d) Need | 6 |
| | (b) | "Attainment of quality requires the performance of a wide | |
| | | variety of identifial task and function." Explain briefly. | 8 |
| | | OR | |
| 8. | (a) | Explain the following terms :- | |
| | | (i) Cost of prevention | |
| | | (ii) Cost of appraisal | |
| | | (iii) Cost of failure | 6 |
| | (b) | What do you mean by the word "Quality" in present day context? | |
| | | What are the quality characteristics? | 5 |
| | (c) | Explain the objectives for 'Break through' and 'Control'. | 3 |
| 9. | (a) | What features of statistics entrusted in statistical quality control? | 4 |
| | (b) | Explain with neat sketches the various patterns of control charts | |
| | | with their expectable causes. | 4 |
| | (c) | Control charts for \mathbf{r} and \mathbf{R} are maintained on a certain dimension | |
| | (0) | of a manufactured part measured in inches. The subgroup size is | 4 |
| | | The values of $$ and $$ are computed for each subgroup size is | т. |
| | | The values of x and K are computed for each subgroup. $\sum_{x=1}^{n}$ | |
| | | After 20 subgroups, $\sum x = 41.340$ and $\sum R = 0.320$. | |
| | | Compute the values of the 3 sigma limits for the \bar{x} and R charts. | |
| | | and estimate the values of σ^1 on the assumptions that the process | |
| | | is in statistical control. | 5 |

10. (a) Explain the difference between Variable control charts and Attribute control charts.

Why a 'np' chart is not recommended when the subgroup size is variable?

In a factory producing spart plugs, the number rejected found in the inspection of 20 lots of 100 each is given :-

| Lot | Number | Fraction | Lot | Number | Fraction |
|-----|----------|----------|-----|----------|----------|
| No. | Rejected | Rejected | No. | Rejected | Rejected |
| 1 | 5 | 0-050 | 11 | 4 | 0-040 |
| 2 | 10 | 0-100 | 12 | 7 | 0-070 |
| 3 | 12 | 0-120 | 13 | 8 | 0-080 |
| 4 | 8 | 0-080 | 14 | 2 | 0-020 |
| 5 | 6 | 0-060 | 15 | 3 | 0-030 |
| 6 | 5 | 0-050 | 16 | 4 | 0-040 |
| 7 | 6 | 0-060 | 17 | 5 | 0-050 |
| 8 | 3 | 0-030 | 18 | 8 | 0-080 |
| 9 | 3 | 0-030 | 19 | 6 | 0-060 |
| 10 | 5 | 0-050 | 20 | 10 | 0-100 |

Total No. of Rejects = 120

Construct appropriate control charts and state whether the process is in control?

11. (a) How might a company protect itself against being supplied with material of inferior quality? Discuss the concept of 'Consumer's risk' and 'Producer's risk', in connection with acceptance sampling scheme.

State the objectives of acceptance sampling.

What are the four types of acceptance control methods? 7

Explain acceptance/rejection and acceptance/rectification plans. 6 (b)

OR

- Explain Single sampling, Double sampling, Multiple 12. (a) sampling and Sequential sampling plan. 10 3
 - Define AQL, LTPD, AOQL. (b)

* * *

2

5

NVD/1295 METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | a) | Define 'metre' as of today. What are advantages | 6 |
|----|-----------|--|---|
| | b) | Give elessification of limit gauges and explain | 0 |
| | 0) | onv two with the help of diagrams | 0 |
| | | | 9 |
| า | a) | UN Explain briefly the difference between the interchangeable | |
| 2. | a) | manufacture and selective assembly | 5 |
| | b) | Why is it pagassary to give a tolerance on an | 5 |
| | 0) | angingering dimension? Give examples of : | |
| | | i) unilateral tolerance | |
| | | i) bilateral equal tolerance | |
| | | iii) bilateral unequal tolerance | 1 |
| | c) | Discuss the salient features of line measuring and | 4 |
| | 0) | measuring instruments | 5 |
| 3 | a) | Describe any of the ontical comparators | 5 |
| 5. | <i>a)</i> | Also comment on the magnification obtained in it | 7 |
| | h) | Explain the construction working and uses of the | / |
| | 0) | universal bevel vernier protractor | 6 |
| | | OR | U |
| 4 | a) | With a neat diagram illustrate the principle of a | |
| | u) | dial indicator show clearly the method adopted | |
| | | to obtain magnification of the plunger movement. | 7 |
| | b) | Name the different elements required to be measured | |
| | -) | checked in order to determine the accuracy of screw | |
| | | threads. Also sketch and explain limit of screw threads. | |
| | | Also sketch and explain limit gauges for internal threads. | 6 |
| 5 | a) | Explain briefly how a precision level can be used to determine | |
| | , | flatness and straightness of machine beds. | 6 |
| | b) | Name and define the various elements of a spur gear which are | |
| | , | checked for correct functioning of a gear. Explain the method | |
| | | for checking pitch of a spur gear. | 7 |
| | | OR | |
| 6. | a) | Explain the base tangent method of gear tooth thickness | |
| | | measurement. | 5 |
| | b) | Discuss the adverse effects of poor surface finish. | |
| | | Also, explain the following terms related to surface | |
| | | texture measurement. | 8 |
| | | (i) Lay (ii) Ra (iii) Sampling length. | |

| SECTION | N B |
|---------|-----|
|---------|-----|

| | | SECTION B | |
|-----|---------|--|----|
| 7. | a) | Explain the term "optimum quality of design" | |
| | | with help of a graph. | 6 |
| | b) | What do you mean by the term "field complaints ? | |
| | | State the significance of field complaints in quality | |
| | | assurance function. | 7 |
| | | OR | |
| 8. | a) | What is "Quality mindness"? How does it help in | |
| | | improving the quality of the product? | 7 |
| | b) | What are the three main elements of quality function? Explain. | 6 |
| 9. | Compa | are X chart with R chart. Discuss the circumstances in | |
| | which | either of the two or a combination of these will be used for the | |
| | purpos | e of control. The following are the \overline{X} and R values of 4 | |
| | subgro | sups of readings :- $3+3+$ | -8 |
| | U | X = 10.2, 12.1, 10.8 and 10.9 | |
| | | R = 1.1, 1.3, 0.9 and 0.8 | |
| | The sp | ecification limits for the components are 10.7 ± 0.2 . | |
| | Establi | ish the control limits for \overline{X} and R charts. Will the product | |
| | able to | meet its specification ? | |
| | | Given : A ₂ (factor for \overline{X} chart) = 0.58 | |
| | | D_4 (factor for R chart) = 2.11 | |
| | | D_5 (factor for R chart) = 0.00 | |
| | | OR | |
| 10. | a) | Compare attribute charts and variable charts of | |
| | | quality control. | 7 |
| | b) | What is process capability? The design specifications | |
| | | for a component are 100 ± 0.5 mm. Whereas the process | |
| | | report shows that process average is 99.9 mm and standard | |
| | | deviation is 0.18. Do these figures call for any action by any | |
| | | one? What action is necessary and by whom? | 7 |
| 11. | a) | Compare random sampling and stratified sampling. | 6 |
| | b) | What is meant by O. C. curve? Sketch neatly | |
| | | the ideal and actual O. C. curve. How O. C. | |
| | | curves are useful in selecting acceptance level? | 7 |
| | | OR | |
| 12. | a) | What do you mean by Acceptance sampling? | |
| | | How does it help in Quality control ? | 5 |
| | b) | Explain Single sampling and Double Sampling plan. | 8 |
| | / | | |

DVW/1193 Third Year B. E. (Prod.) Examination METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | a) | What do you understand by Line and End measurement? | |
|----|-----|--|---|
| | | Discuss their relative characteristics. | 6 |
| | b) | Determine the diamensions and tolerances of shaft and hole | |
| | | having size of 30 H_7 h ₈ . Also determine the allowances (i.e. | |
| | | minimum and maximum clearances). | |
| | | Use may use : | |
| | | 1) 30 mm lies in 18-30 step, | |
| | | 2) i = 0.45 $\sqrt[3]{D}$ + 0.001 D. | |
| | | 3) IT.7 = 161 and IT 8 = 25i. | 8 |
| | | OR | |
| 2. | a) | What is gauge maker tolerance and were tolerance? | |
| | | How it is applied in gauge design ? | 4 |
| | b) | What are the advantages and limitations of limit gauges ? | 3 |
| | c) | Explain with neat sketches the basic hole system and | |
| | | unilateral system. | 7 |
| 3. | a) | A 200 mm size bar is to be set to an angle of 32° 5' 6". | |
| | | Find the length of gauge blocks required from 87 piece set. | 6 |
| | b) | Give the fundamental requirements which every comparator | |
| | | must fulfil. | 7 |
| | | OR | |
| 4. | a) | Give importance of front reflecting mirror in case of optical | |
| | | comparator. How magnification is achieved in optical | |
| | 1 \ | comparator ? | 6 |
| - | b) | Explain 'Principle of Vernier' and use of Vernier height gauge. | 7 |
| 5. | a) | What do you mean by 'Master Gear'? Give the different | |
| | | elements to be checked for accuracy of a gear. (Spur Gear). | 7 |
| | 1) | Explain in short any three. | / |
| | D) | What are the components of surface 1 exture ? | (|
| (| `` | what is the reason for controlling surface texture ? | 6 |
| 6. | a) | Explain Tomlinson surface meter. | |
| | D) | Enumerate the advanatages and limitations of dial indicator. | 6 |
| | | SECTION B | |
| 7. | a) | The Quality cost is determined as internal failure cost and | |

| a) | The Quality cost is determined as internal failure cost and | |
|----|---|---|
| | external failure cost. Explain. | 6 |
| b) | Attainment of quality requires the performance of wide | |
| | variety of identifiable task and functions. Explain. | 8 |

| 8. | a) | What do you understand by 'Quality audit and how is it | |
|----|----|---|---|
| | | conducted in an industrial organization? | 8 |
| | b) | What do you mean by the word 'Quality' in present day context ? | |
| | | What are the Quality characteristics ? | 6 |
| 9. | a) | Why statistics comes to frey in quality control? | 5 |
| | b) | Data were collected for a large box of bolts containing about | |
| | | 10% non-confirming items. Plot 'np' chart based on the | |
| | | data given below. | 8 |

| Sub group | Number | Number | Sub group | Number | Number |
|-----------|-----------|------------|-----------|------------|------------|
| No. | Inspected | Non- | No. | Inspected | Non- |
| | _ | conforming | | _ | confirming |
| 1 | 200 | 28 | 13 | 200 | 20 |
| 2 | 200 | 20 | 14 | 200 | 23 |
| 3 | 200 | 24 | 15 | 200 | 28 |
| 4 | 200 | 19 | 16 | 200 | 28 |
| 5 | 200 | 17 | 17 | 200 | 15 |
| 6 | 200 | 25 | 18 | 200 | 23 |
| 7 | 200 | 25 | 19 | 200 | 17 |
| 8 | 200 | 22 | 20 | 200 | 22 |
| | | | 21 | 200 | 25 |
| 9. | 200 | 22 | 22 | 200 | 20 |
| 10. | 200 | 16 L | 23 | 200 | 18 |
| 11. | 200 | 22 | 24 | 200 | 14 |
| 12. | 200 | 18 | 25 | 200 | 13 |
| | | | * * * | | |
| | | | | | |
| | | | | | |

MNL-820/ALL-2772 METROLOGY AND QUALITY CONTROL

SECTION-A

| 1. | (a) | Discuss the characteristics of line standards and end standards. | 6 |
|----|-------|--|---|
| | (b) | what are limit gauges ? Sketch and explain any two types of | 0 |
| | | limit gauges. | 8 |
| 2 | (2) | OR State Textler's mineriale in design of limit severes | |
| Ζ. | (a) | State Taylor's principle in design of limit gauges. | |
| | | what are the advantages of using progressive type gauge versus | 0 |
| | г 1 | double ended plug gauge for checking holes ? | 8 |
| | Expla | ain clearly the following types of fits :- | |
| | Selec | tive fit | |
| | Drivi | ng fit | |
| | Force | ed fit | |
| | Shrin | kage fit. 6 | |
| 3. | (a) | What are possible errors in an external screw threads ? | |
| | | Sketch and explain limit gauges for external threads. | 8 |
| | (b) | Clearly distinguish between limit gauges and comparators. | 5 |
| | | OR | |
| 4. | (a) | What are advantages of optical comparator over mechanical | |
| | | comparators? Sketch and explain any one type of optical | |
| | | comparator. | 7 |
| | (b) | Which conditions must exist if a sine bar is to be accurate ? | |
| | | How sine bar is used for large components ? | 6 |
| 5. | (a) | Define tooth thickness in case of a simple spur gear. | |
| | | How it is measured using vernier gear tooth caliper? | |
| | | What is the expected accuracy of such a vernier? | 7 |
| | (b) | Discuss the applications of Tool Maker's microscope. | 6 |
| | | OR | |
| 6. | (a) | Sketch and explain the working of Tomblinson surface meter. | 7 |
| | (b) | Define the term "Squareness" of a try-square. | |
| | | Describe in brief the reversal method used to test the | |
| | | squareness error of an engineer's square. | 6 |
| | | SECTION-B | |
| 7. | (a) | Define the term quality. Also differentiate between quality | |
| | | of design and quality of conformance. | 6 |

of design and quality of conformance.Explain the term "Quality Assurance Function".What is "Quality mindness" ? How does it help in improving the quality of the product ?

7

| 8. | (a |) | What d | o you | unders | tand by $\mathbf{W} = \mathbf{P}$ | Vendor | Qualit | y Ratin | g ? | | |
|--------|-----|---------------|--|-------------------|--------------------|-----------------------------------|-------------|------------|--------------------|-------------|----|---|
| | (h |) | Explain | n the f | need of ollowin | V.Q.K. Ig as ani | olied to | the qua | lity cor | ntrol ·- | | |
| | (0 |) | (i) | Appr | aisal Co | ost | | ine qua | | nuor . | | |
| | | | (ii) | Preve | ntion C | ost | | | | | | |
| | | | (iii) | Failu | re Cost | | | | | | | |
| | | | (iv) | Optin | num Co | ost. | | | | | | |
| 9. | (a | .) | Disting | uish t | etween | variabl | e data a | ind attri | bute da | ta with | | |
| | Б | . 11 | approp | riate e | xample | S. | | an af ar | | 1 | | |
| | F(| SHOW | ing tabl | e reie | rs to the | e averag | e numb | er of ot | itlet lea | ks per | | |
| | | | Taulator | 101 1 | 0 1015 0 | 1 100 12 | | acii | | | | |
| Lot N | No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |] |
| Num | ber | | | | | | | | | -0 | |] |
| of lea | aks | 15 | 17 | 12 | 16 | 14 | 5 | 14 | 11 | 9 | 10 | |
| (c) | | | | | | | | | 0 | | | |
| | E | stabli | sh u cha | irt for | the futu | are prod | luction. | | | | | |
| | | | | | | | | | | | | |
| 10. | W | $\frac{1}{2}$ | That is "Process capability"? Plot X and R charts if $\overline{X} = 357.50$, $\Sigma R = 9.90$, Number of subgroups = 20. | | | | | | | | | |
| | 2 | X = | | | | | | | | | | |
| | It | is giv | ven that | $A_2 =$ | 0.18, D | $_{3} = 0.41$ | $, D_4 = 1$ | .59 and | $d_2 = 3$ | .735. | | |
| | A | lso fi | nd the p | roces | s capab | ility and | l comm | ent on t | he proc | ess. | | |
| 11. | (a | .) | State th | e adv | antages | and lin | nitations | s of sam | npling | | | |
| | (h | | Inspect | ion as | compa | red to 1 | 00% ins | spection | l. | _ | | |
| | (0 |)) | Explain plan wi | i singi th res | nect to | nng pia their res | n and u | ouble sa | amping ance cri | ; iteria | | |
| | | | | 11105 | | then res | spective | OR | | uu11a. | | |
| 12. | (a |) | What is | s meai | nt by O. | .C. curv | e? Ske | etch nea | tly | | | |
| | (| / | the idea | al and | actual | O.C. cu | rve. Ho | w 0.C. | curves | | | |
| | | | are uset | ful in | selectin | ig accep | tance le | evel? | | | | |
| | D | iscus | s the int | erests | of the o | consum | er and t | he | | | | |
| | | | produce | er in t | he selec | ction of | samplir | ng plans | 5. | | | |
| | | | | | | | | la ala ala | | | | |
| | | | | | | | | * * * | | | | |

University, placement, school and entrance exam question paper-How To Exam?

ICA/772 METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | a) b) c) | Define present day meter in optical term. Clearly distinguish between Line Standard and End Standard. What do you understand by term Tolerance and allowance ? | 2 4 3 |
|----|----------------|--|-------------|
| | d) | Give the advantages of using wave-length standard to define primary standard. | 4 |
| 2. | a) | What do you understand by limit gauges ? State Taylor's principle for designing limit gauges. | 4 |
| | D) | plug gauge suitable for 20H7 You can use either IS 919 or the following information. i) 20 mm lies in diameter steps 18-30 mm, | |
| | | ii) Fundamental Tolerance unit in micron, $i = 0.45 \sqrt[3]{D} + 0.001 \text{ D}.$ | 10 |
| 3. | a) | What is comparator? Give some design considerations for comparator. | 3 |
| | b) | Explain the principle of optical comparator, | 4 |
| | c) | give its advantages and disadvantages. State the essential requirements for accuracy in construction of sine bar. | 4 |
| | | Why it is that the use of sin bar is not recommended for angles larger than 45 [°] with the reference plane ? | 6 |
| 4. | a) | What is meant by drunken thread ? What difficulties does it present in finding the pitch of the thread ? | 3 |
| | b) | Name the different elements required to be measure in order to determine the accuracy of screw thread | 2 |
| | c) | Give the methods of measuring the effective diameter of a screw thread Explain the three wire method of ascertaining | 3 |
| | | the effective diameter of a screw thread. | 7 |
| 5. | a) | Name and define the various elements of a spur gear which are checked for the correct functioning of a gear. | 7 |
| | b) | Explain briefly each of the following terms showing its importance in measurement of surface texture. i) lay, ii) Ra. | |
| | | iii) Primary texture, iv) Secondary texture. | 6 |

| 6. | a) b) | Explain the use of dial gauge and varnier height gauge. Describe with sketch the working principle and | 6 |
|-----|----------|---|---|
| | | application of auto callimator. | 7 |
| | | SECTION B | |
| 7. | a) | What is the meaning of quality of conformance ? | |
| | | Explain factors which influence the quality of | Δ |
| | b) | Define the term 'quality control' and explain its | т |
| | | advantages over inspection technique. | 4 |
| | c) | "Higher quality of design usually cost more and higher | |
| | , | quality of conformance usually cost less". Comment. | 6 |
| 8 | a) | How quality mindedness can be created in the organization? | 4 |
| 0. | b) | What is quality assurance? What are the steps involved in it? | 5 |
| | c) | "Inspection planning is a part of planning for quality". Comment. | 4 |
| 9 | a) | Describe briefly the 'Run Sum test' | 3 |
| | b) | What do you meant by process canability ? | 5 |
| | 0) | How will you determine the same ? | 6 |
| | A sub | group of 5 items each are taken from a | Ũ |
| | | manufacturing process at a regular interval. | |
| | | A certain guality characteristics is measured and | |
| | | r and R values computed After 25 sub-groups it is found that | |
| | | $\sum \bar{x} = 357.50$ and $\sum R = 8.80$ | |
| | | If the specification limits are 14.4 ± 0.40 and if the process is in | |
| | | statistical control, what conclusion can you draw about the ability | |
| | | of the process to produce items within specification? | 5 |
| | | OR | |
| 10. | a) | What do you understand by "Statistical control | |
| | | of production process"? | 4 |
| | b) | What are the advantages of use of statistical methods | |
| | 、 、 | in quality control ? | • |
| | c) | What is meant by natural tolerance of the process ? | 3 |
| 11. | a) | State and explain advantages of limitations of acceptance | 1 |
| | b) | Sampling over 10070 inspection. | 4 |
| | U) | inspection and the meaning of the terms – | |
| | | i) Producers Risk | |
| | | i) Consumer's Risk | 0 |
| | | | 2 |

| 12. | a) | Differenciate between Acceptance/Rejection and | |
|-----|------|---|---|
| | | Acceptance/Rectification schemes. | 4 |
| | b) | Explain the following terms (any two) - | |
| | AQL, | | |
| | | ii) AOQL, | |
| | | iii) LTPD. | 6 |
| | c) | What are the advantages and disadvantages of double | |
| | | sampling plan ? | 3 |

Hove Show

STD-1122/TMG-7628 METROLOGY AND QUALITY CONTROL

SECTION A

| 1. | (a) | Enlist the advantages of wavelength standard. Define 'Meter' | 2 |
|----|-------|---|---|
| | (b) | Explain with neat sketches various types of limit gauges | 3 |
| | | and their applications. | 7 |
| | (c) | Define the following terms :- | |
| | | (i) Limits | |
| | | (ii) Fits | |
| | | (iii) Tolerances | |
| | | (iv) Allowance. | |
| | | OR | |
| 2. | (a) | Give the meaning of following specifications of limit gauges :- | |
| | | (1) $30 \text{ H} /$ (ii) $40 \text{ d} 5$ | 1 |
| | (b) | (II) 40 a J. Explain the concept of 'Interchangeshility' and | 4 |
| | (0) | 'Selective Assembly' | 5 |
| | (c) | What are the characteristics of line standards and end standards? | 5 |
| | (0) | what are the characteristics of the standards and cha standards : | 5 |
| | | | |
| 3. | (a) | How comparator differs from limit gauge ? | |
| | | Explain with a neat sketch the working of Pneumatic comparator. | 5 |
| | A 100 |) mm sine bar is to be set at 22° . Determine the slip gauges | |
| | | needed from 87 piece set. | 4 |
| | Expla | in with neat sketch any two types of limit gauges | |
| | | for screw threads. | 4 |
| | | OP | |
| | | OK | |
| 4. | (a) | How mechanical magnification is obtained in plunger type dial indicator? Give various applications of dial indicator with | |
| | | the help of sketches | 6 |
| | (b) | Explain with a neat sketch the working of optical comparator 4 | Ŭ |
| | (c) | Enumerate various instruments used for angular measurements | |
| | | with their expected accuracies. | 3 |
| | | | |
| 5. | (a) | What are the possible errors in a spur gear ? | |
| | | Explain the working of 'Parkinson Gear tester'. | 7 |
| | (b) | Explain the basic working principle of autocolimeter. | |
| | | Give its applications with the help of sketches. | 6 |

| | | OR | |
|----|--------------|--|-----|
| 6. | (a) | In the measurement of surface roughness height of 20 successive peaks and troughs were measured from a datum and were 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 22, 21, 22, 21, 25, 26, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20 | |
| | | 32, 21, 37, 18, 35, 20 microns. If measurements were obtained | |
| | | of the rough surface | 1 |
| | (b) | Explain 'Tool Maker's microscope' | 4 |
| | (0) | Give its uses and expected accuracy. | 5 |
| | (c) | How will you measure thickness of gear tooth using Vernier gear tooth caliper ? | 4 |
| | | SECTION B | |
| | | | |
| 7. | (a) | Define 'Quality'. Discuss the factors controlling quality of design | . 5 |
| | (b) | What is quality control? State its objectives. | 3 |
| | (d) | What is qualify mindedness? | 6 |
| | | How does it help in improving quality of product ? | 0 |
| | | OR | |
| _ | | | |
| 8. | (a) | What do you mean by quality cost ? | - |
| | (b) | Describe various categories of quality costs. | 7 |
| | (D) | Discuss the steps involved in the quality control process. | / |
| 9. | (a) | Control charts for \overline{X} and R are maintained on the tensile strength | |
| | | in N of a certain yarn. The subgroup size is 5. The values of \overline{X} | |
| | | and \overline{R} are computed for each subgroup. After 25 subgroups | |
| | | $\sum \overline{X} 518.8, \Sigma R = 120.$ | |
| | (i) | Compute the values of 30 limits for \overline{X} and R charts. From table : | |
| | | $A_2 = 0.58$ | |
| | | $D_2 = 0$ $D_1 = 2.11$ | |
| | (ii) | $D_4 = 2.11$. How will you decide whether the process is "in control" or | |
| | (11) | "out of control"? | |
| | (iii) | If a point representing certain subgroup in a control chart | |
| | | goes outside the control limits, what action should be taken? | 9 |
| | (b) | Being a 'Quality control person' how will you make choice | |
| | | between X, R, P and C charts ? | 4 |

11.

12.

10. The following are the results of daily inspection of a variance tube. Compute the value of fraction defective for each day inspection and plot the control chart. Find revised control limits and check these points and replot. Also comment on process capability :-

| Ma | y 1996 | Lot size 'n' | Number of defectives '\phi' |
|------------|--|---|---|
| | 3 | 1024 | 30 |
| | 5 | 2056 | 86 |
| | 6 | 16835 | 108 |
| | 7 | 16069 | 59 |
| | 12 | 7369 | 29 |
| | 13 | 8738 | 10 |
| | 14 | 1220 | 112 |
| | 17 | 16242 | 76 |
| | 18 | 15145 | 8 |
| | 24 | 5845 | 8 |
| | 25 | 13582 | 154 |
| (a) (b) | Define 'Ao Also distin stratified s In a single the lot size (i) Plo (ii) Fin 0.5 | cceptance sampling aguish between rand ampling. sampling plan, n = is large in compar- of the O.C. curve for d the probabilities % and 6% defectiv | don sampling and 10 and C = 3, ison to the sample size. r sampling plan. of acceptance of lots es. |
| | | | OR |
| (a) | Discus the | principles of accer | otance sampling. |
| (b) | Give comp suitable ex | plete analysis of Do ample. | buble sampling plan with |
| | | | |

13

5

8

5

8

PTV/869 AUTOMATIC CONTROL

SECTION A

6

7

| 1. | (a) | Obtain the transfer function of the mechanical | |
|----|------|--|---|
| | | system shown in fig.1. | 6 |
| | Obta | in the transfer function $y(s)/x(s)$ of the signal | |
| | | flow graph shown in fig.2. | 7 |

2. (a) A thermometer is dipped in a vessel continuing liquid at a temp of θ^{1} (t). The thermometer has a thermal capacitance for storing heat as C and a thermal resistance to limit heat flow as R. If the temperature indicated by the thermometer is $\theta_{0}(t)$, obtain the transfer function of the system.

Obtain the transfer function for the system shown in fig.3 by using block diagram reduction method.

3. (a) What are pneumatic relays? Explain bleed type and non – bleed type of pneumatic relays with the help of suitable diagrams. 8 (b) Draw and explain the block diagram of automatic control system. 5 OR

4. (a) Explain the working of hydraulic servomotor with the help of suitable diagram. Derive the transfer function for it. 7 5. (a) The closed loop transfer function is given by.

$$\frac{c(s)}{R(s)} = \frac{K}{s^2 + a \, k \, s + k}$$

Determine the value of 'K' and 'a' so that the maximum overshoot in unit step response is 50% and the peak time is 5 seconds.

7

5

(b) Certain measurements were conducted on a servomechanism which show the system response as $c (t) = 1 + 0.2 e^{-60t} - 12 e^{-10t}$ when subjected to a unit

step input.

- (i) Find the expression for closed-loop transfer function.
- (ii) Obtain the undamped natural frequency and damping ratio of the system. 7

OR

6. (a) Figure, 4 (a) shows a mechanical vibratory system.
When 12 N of force is applied to the system, the mass oscillates as shown in fig. 4(b). Determine values of M, F and K for the system from response curve.



Explain the time domain specification with the help of suitable diagrams.

SECTION B

| 7. | (a) | Explain the stability concept with reference to the control system | 5 |
|----|-----|--|---|
| | (b) | For the unity feedback system, | C |
| | | $G(s) = \frac{K}{s(s+2) (s+1)}$, plot the root locus. | 7 |
| | | OR | |
| 8. | (a) | For a system G(s) H(s) $\frac{K(1+s)}{S^3}$, Find range of K | |
| | | for system to be stable. | 5 |
| | (b) | Sketch the root locus of the unit feedback system with | |
| | | open loop transfer function G(s) $\frac{K(s+2)}{(s+1)^2}$ | 8 |

| 9. | (a) | What is frequency response ? | E |
|-----|---------------|--|----|
| | (b) | What are the drawbacks of direct polar plots 2 | 3 |
| | (0) | How are they overcomed? Sketch the polar | |
| | | plot for the transfer function G (s) = $\frac{10}{s(s+1)}$ | 8 |
| | | OB S(S+1) | |
| 10. | Sketch | the Bode plot for a unity feedback system | |
| | charac | terized by the loop transfer function. | 13 |
| | | $C(x) = K(1 + 0.2 \ jw) \ (1 + 0.025 \ jw)$ | |
| | | $O(s) = \frac{1}{(jw)^3(1+0.001jw)(1+0.005jw)}$ | |
| 11. | (a) Derive | Discuss the procedure of compensation using Bode plot. the transfer function for electrical lag compensator | 5 |
| | | and explain the effects of lag compensation. | 8 |
| 12. | (a) | A unit feedback system has open loop transfer function. | |
| | | $G_{f}(s) = \frac{K}{s^{2}(1+0.2s)}$ | |
| | | Design a Load compensator to meet the following | |
| | | specifications. | |
| | | Acceleration error constant $K_2 = 10$ phase margin = 35° . | 14 |
| | | * * * | |
| | | | |
| | | | |

NVD/1293 AUTOMATIC CONTROL

SECTION A

7

8

1. (a) Why analogous system are important in control engineering ? Find an analogous mechanical system for an electrical system shown in fig.1, based on force voltage analogy.

Distinguish between following THREE types of system : Linear and non linear Time variant and Time invariant

OR

2. (a) Find out the transfer function for the control system shown in fig.2 using block diagram reduction method.

(b) Find the gain x_2/x_1 , for the signal flow graph shown in fig.3. 6

| 3. | Explain how PID control can be obtained with the help of a pneumatic control action. Give its schematic diagram and derive its transfer function. | | 13 |
|----|---|---|----|
| 4. | (a) | Explain the working of pneumatic proportional plus derivative controller with the help of a neat sketch | |
| | | and derive transfer function for it. | 9 |
| | (b) | Enlist the basic control actions and explain any one of them. | 4 |
| 5. | (a) | Define steady state error and error constants of control systems. Deduce the error constant for type '0' and type '1' systems. | 6 |
| | Fig.4 shows a position control system with velocity feedback. Find the time respose specification, when the system is subjected to unit step input. | | |

OR

| 6 | () |
|----|-----|
| n | (8) |
| 0. | (u) |

(a) The open loop transfer function of a unity feedback system is,
$$k$$

$$G(s) = \frac{\kappa}{s(s+3)}$$

The specifications of a step input respose are as follows. Peak time = 0.8 sec.

Percentage overshoot = 7%

- (i) Whether both specifications can be met simultaneously by a single value of K?
- (ii) If not, determine the compromise value of K so that the specified values of peak time and percentage overshoot are relaxed by same percentage.
- (b) What do you understand by absolute stability, relative stability and steady state error ?

SECTION B

7. Open loop transfer function of a closed loop control system is given by

G(s) H(s) =
$$\frac{K}{(s+3)(s+5)(s+1)}$$

Draw root locus for this control system and also out value of K Which will make system unstable.

8. (a) Draw root locus of the control system having open loop transfer function

G(s) H(s) =
$$\frac{K(s+4)}{S(s+2)}$$

(b) The characteristic equation of a control system is given by $s^4 + 6s^3 + 11s^2 + 6s + k = 0$

what restrictions must be placed upon the parameter k in order to insure that the system is stable ?

7

10

3

9. Draw Bode plot for the control system having open loop transfer function

G(s) H(s) =
$$\frac{s20 (s+2)}{s (s+1) (s^2 - 8s + 64)}$$

also find out phase margin, gain margin, phase cross over frequency and gain cross over frequency. 14

OR

| 10. | (a) | Differentiate polar plot and bode plot. | 5 |
|-----|--------------------------|---|--------|
| | (b) | Obtain polar plot of the following transfer function. $G(s) = \frac{e^{gL}}{1 + sT}$ | 5 |
| | (c) | Explain the terms resonance frequency and resonance p | beak.4 |
| 11. | (a) | Derive transfer function for electrical lead network. | 6 |
| | (b) | Explain the procedure for designing a lead compensato by root locus method. | r 7 |
| 12. | The f | Frequency transfer function of a second order control syste $G(jw) = \frac{k}{jw \ (jw+1)}$ | em is |
| | Desig follov great | gn a feedback control system which would satisfy the wing frequency domain specifications phase margin er than 40^{0} | |
| | C | $K \ge 12 \text{ sec}^{-1}$ | 13 |