UNIVERSITY OF PUNE
[4363]-152
T. E. (Prod s/w) Examination, (Sem-II)
KINEMATICS DESIGN OF MACHINES
(2008 Pattern)

Total No. of Questions : 12   [Total No. of Printed Pages :6]
[Time : 3 Hours]   [Max. Marks : 100]

Instructions :

(1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section-I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q. 12 from Section-II
(2) Answers to the **two sections** *should be written in* **separate answer-books**.
(3) Neat diagram must be drawn wherever necessary.
(4) Black figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION-I
UNIT NO. 01

Q1.
a) Explain with neat sketch, the kinematic analysis of bevel gear generator.[08]
b) Explain "Three position synthesis by Chebychev Spacing' with figure.   [08]

OR

Q2.
a) Explain following kinematic chain representation with figure: [08]
   1) E-22   2) C-12   3) K-23   4) E-21
b) Design a slider crank mechanism to co-ordinate three positions of the input and output links as follows;   [08]
   θ_1=20°, θ_2=35°, θ_3=50°
   S_1=80mm, S_2=60mm, S_3=30mm
   To find a,b,e

UNIT NO.2

Q3.
a) What is cumulative fatigue damage? How the life of component subjected to different values of fluctuating stresses in cycle is estimated by using Miner's equation?   [08]
b) A steel bar is subjected to two dimensional stresses; the tensile stress along

the X-axis varies from 45MPa to 100MPa, whereas the tensile stress along the Y-axis varies from 5MPa to 75 MPa. The corrected endurance strength of the components is 260MPa. The ultimate strength is 650MPa. Determine the factor of safety by maximum distortion energy theory. Use the Goodman's fatigue criterion for failure. [08]

OR

Q4.
a) A steel cantilever beam shown in figure is subjected to a transverse loading at its ends that varies from 45N up 135N down. Determine the required diameter at the change of cross section for infinite life using a factor of safety of 2.0
Assume following data: [16]
- Yield strength $=470N/mm^2$
- Ultimate tensile strength $=550n/mm^2$
- Theoretical stress concentration factor $=1.63$
- Notch Sensitivity $=0.8$
- Reliability factor $=0.923$
- Surface finish factor $=0.9$
- Size factor $=0.85$

Fig. Que 4(a)
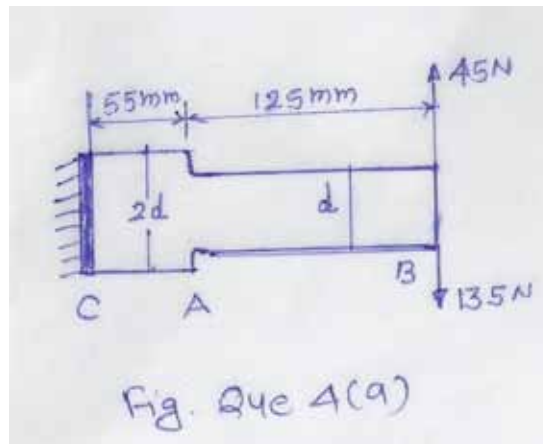
UNIT NO. 03

Q5.
a) Define gear? State advantages and limitations of gear drive. [6]
b) A spur gear pair is to transmit 10Kw power from an electric motor running at 1440rpm to machine tool expected to run exactly at 600 rpm. The pinion and gear are made up of alloy steel grade7. The pinion and gear are to be hardened to 350BHN. Design the gear pair by using the dynamic factor and

Spott's Equation.
Use following data:
Service factor=1.5
Factor of safety=1.5
Face width=10 module
Tooth system=20° full depth involute
Load distribution factor=1.4
Kv=6/6+v
For Grade 7, e=11.0+0.9(m+0.25$\sqrt{d}$)
Lewis Factor, $y = 0.484 - \frac{2.87}{Z}$

$$Fd = \frac{e.n_p.Z_p.b.r_p.r_g}{2527\sqrt{r_p{}^2+r_g{}^2}} \times cos\phi$$

Notations have usual meaning. [12]

<div align="center">OR</div>

Q6.
a) Define the following terms: [04]
1) Barth Factor   2) Dynamic load
b) A 18 teeth helical pinion is to mesh with 45 teeth helical gear mounted on parallel shaft. The pinion & gear are made up of plain carbon steel having permissible bending stress of 105n/mm². The pinion is to be driven by 2.5kw, 1440rpm three phase induction motor. The starting torque of motor is 25% more than the rated torque. The factor of safety required is 1.5 The tooth system is 20° full depth involute while the helix angle is 25° the ears are to be meet the specification of grade 7. Design the gear pair by using the dynamic factor & Spott's equation for dynamic load. Specify the hardness of gear pair.
Use following data:
Dynamic Factor K$_v$=$\frac{5.6}{5.6+\sqrt{V}}$
For Grade 7, e=11.0+0.9($m_n + 0.25\sqrt{d}$)
Lewis factor, $Y' = 0.484 - \frac{2.87}{Z'}$

$$Fd = \frac{e.n_p.Z_p.b.r_p.r_g}{2527\sqrt{r_p{}^2+r_g{}^2}} \times cos\phi_n\ cos\varphi$$

b=10m$_n$
Notations have usual meaning. [14]

<div align="center">

SECTION-II
UNIT NO. 04

</div>

Q7.

a) A ball bearing operates on a work cycle consisting of three parts as shown in table:

SN	Fraction of cycle	Radial Load 'Fr'	Speed in rpm
1	30%	4000 N	720
2	50%	6000 N	1400
3	20%	5000 N	1000

The basic dynamic capacity of the bearing is 30700 N'

Calculate:
1) The rating life of the bearing in hours.
2) The average speed of rotation.
3) The life of the bearing with 95% reliability. [12]

b) Explain the following properties of sliding contact bearing material.
   1) Conformability   2) Bondability   3) Corrosion resistant   [06]

OR

Q8.
a) Select a single row deep groove ball bearing with the following operating cycle listed below, which will have a life of 15,000hrs.   [10]

Fraction of cycle	Type of load	Radial Load 'Fr' N	Thrust Load 'Fa' N	Speed rpm	Service Factor
1/10	Heavy Shocks	2000	1200	400	3.0
3/5	Light Shocks	1500	1000	500	1.5
3/0	Moderate Shocks	1000	1500	600	2.0

Assume radial and axial load factors to be 1.0 and 1.5 respectively and the inner race rotates.

Data for Deep Groove ball bearing selection is

Bearing No.	6015	6215	6315	6415
'C' KN	31	52	90	120

b) Differentiate between the static capacity and dynamic capacity of a ball bearing. What is their significance in the selection of bearing?   [5]
c) How bearings are designated? Explain.   [3]

UNIT NO.05

Q9.

a) A machine shaft runs at a mean speed of 300 rpm. It requires a torque which varies uniformly from 1500Nm to 4000Nm during first half revolution, during next on revolution, the torque remains constant and then decreases uniformly to 1500Nm during next one revolution, and then it remains constant for remaining one revolution. The machine is coupled by a constant speed motor to which is connected a solid flywheel of radius 0.80m. If the fluctuation of speed is ± 2% of mean speed. Find

1) Power of motor
2) Mass of flywheel
3) Thickness of flywheel if $\rho = 7200 kg/m^3$ [16]

OR

Q10.

a) Write short note on 'Construction of Flywheel'. [06]

b) A single cylinder internal combustion engine working on four stroke cycle develops 75 Kw at 360rpm. The fluctuation of energy can be assumed to be 0.9 times the energy developed per cycle. If the fluctuation of speed is not to exceed 1% and the maximum centrifugal stress in the flywheel is to be 5.5MPa, estimate the mean diameter and the cross sectional area of the rim. The material of the rim has a density of 7200kg/m³ [10]

UNIT NO. 06

Q11.

a) A shaft and hole assembly of nominal diameter 30mm have the following dimensions: [12]

$$Shaft\ Diameter = 30\ {}^{-0.1}_{-0.15}mm\ \&\ Hole\ Diameter = 30\ {}^{+0.1}_{+0.0}mm$$

Assuming the shaft and hole diameters are normally distributed, determine:
1) The percentage of assemblies having clearance less than 0.14mm; and
2) The percentage of assemblies having clearance greater than 0.20mm
The areas below the standard normal distribution curve from zero to z are as follows:

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
Z	1.8	1.9						
Area	0.4641	0.4713						

b) What do you understand by incompatible specification? [04]

OR

Q12.

a) What is the importance of reliability in the modern engineering design? How does it is differ from the factor of safety? [06]

b) What is the adequate design and optimum design? Explain with suitable examples. [04]

c) Explain the following terms used in Johnson's method of optimum design.
   1) Primary design equation
   2) Subsidiary design equation
   3) Limit equations [06]

[Total No. of Questions: 12]   **[Total No. of Printed Pages: 4]**

UNIVERSITY OF PUNE
[4363]-149
T. E. (PROD. ENGG./ PROD. ENGG.S/W) Examination - 2013
NUMERICAL TECHNIQUES AND DATABASE (2008 Course)

[Time: 3 Hours]   **[Max. Marks: 100]**

Instructions:

1 *Answer any three questions from each section*

2 *Answers to the two sections should be written in separate answer-books.*

3 *Black figures to the right indicate full marks.*

4 *Neat diagrams must be drawn wherever necessary.*

5 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6 *Assume suitable data, if necessary.*

SECTION -I
UNIT –I

Q.1	A	What is a database model? Explain any two types of data models with an example for each.	8
	B	Discuss the three level architecture of DBMS. Explain how does it lead of data independence.	8

OR

Q.2	A	Why is the administration of a database system required? What are the various functions associated with database administration?	8
	B	Define a data manipulation language. Compare DBMS and File processing system with following points: i) Redundancy ii) Access Control	8

UNIT II

Q. 3	A	Consider an employee file with the details given below	14

Record	E No	Name	Occupation	Degree	Sex	Location	Salary
A	800	Milind	Programmer	ME	M	Delhi	10000
B	565	Adwet	Analyst	BE	M	Mumbai	6000
C	75	Devendra	Analyst	ME	M	Delhi	8000
D	569	Mukesh	Programmer	BE	M	Chennai	9000

i)   Create the above table using SQL syntax

ii)   Write a query to retrieve the record of Salary > 12000 Degree = M.E., Location = Delhi,

Occupation = Analyst , Sex = M.

     iii)   Insert additional record E with appropriate data for other columns

     iv)   Write a query to modify occupation of record C to Senior Analyst

     v)   Write a query to delete the created record E.

	B	Explain the difference between DELETE and TRUNCATE commands?	4

OR

Q. 4	A	Describe the components of entity-relationship diagram with suitable examples	6
	B	Write a short note on normalization with an example	6
	C	What is the difference between	6

     i)   a HAVING CLAUSE and a WHERE CLAUSE

     ii)   UNIQUE and PRIMARY KEY constraints?

UNIT III

Q. 5	A	What do you understand by EDI? Why EDI important in e-commerce? Explain?	8
	B	What is ERP? Explain ERP with respect to production and operations management?	8

OR

Q. 6	A	Explain the following terms:	8

     i)   Data

     ii)   Information

     iii)   Knowledge

     iv)   Artificial Intelligence

	B	What is an expert system? Explain in brief the need and structure of expert systems in manufacturing?	8

SECTION II
UNIT -IV

Q. 7	A	Write a C program to determine the area of a triangle using the formula area= $\sqrt{s(s-a)(s-b)(s-c)}$, where s=$\frac{a+b+c}{2}$	6
	B	Round off the numbers 865250 and 37.46235 to four significant figures and compute absolute error, relative error and percentage error in each case.	6
	C	Write a C program that reverses the digits of a given positive integer say 1234 using a while loop.	6

OR

Q. 8	A	What do you mean by truncation error. Find the truncation error for e^x at x=1/5 if first three terms are	6

retained in expansion.

$$\text{Take } e^x = 1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\dots, \ -\infty < x < \infty$$

B   Evaluate $\sqrt{12}$ to four decimal places by Newton-Raphson method.   6

C   Solve the following system of equations using Gauss-Siedal iterative method.   6

9x+4y+z = -17

x-2y-6z =14

x+6y = 4

UNIT -V

Q. 9   A   Show that the line of fit to the following data is given by $y = 0.7 \ x + 11.285$.   6

X	0	5	10	15	20	25
y	12	15	17	22	24	30

B   The following table gives the marks secured by 100 students in the Numerical Analysis subject   10

Range of marks	30-40	40-50	50-60	60-70	70-80
No. of students	25	35	22	11	7

Use Newton's forward difference interpolation formula to find:
   i)   Number of students who got more than 55 marks
   ii)   Number of students who secured marks in the range from 36 to 45

OR

Q. 10   A   The function $y = f(x)$ is given at the points (7,3), (8,1), (9,1) and (10,9). Find the value of y for x = 9.5 using Lagrange's interpolation formula.   8

B   Obtain a relation of the form $y=a.b^x$ for the following data by the method of least squares   8

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	126.4

UNIT – VI

Q. 11   A   "You want to buy a new car and have identified four models you like: a VW Golf, an Opel Astra, a Ford Focus and a Toyota Corolla. The decision will be made according to price, petrol consumption, and power. You   8

prefer a cheap and powerful car with low petrol consumption".
Explain the concept of "optimization" by assuming suitable data for the parameters gives in the above statement.

B   Solve the equation by using finite difference method   8
$y''(x) - x.y'(x) = 0$ for $y(x_i)$, $x_i = 0, 1/3, 2/3$. Given that $y(0) + y'(0) = 1$ and $y(1) = 1$.

<div align="center">OR</div>

Q. 12   A   Given $\frac{dy}{dx} = y-x$, $y(0)=2$. Find $y(0.1)$ and $y(0.2)$ correct to   8
four decimal places using Runge-Kutta second order method.

B   Solve by using Runge-Kutta method $\frac{dy}{dx} = yz + x$,   8

$\frac{dz}{dx} = xz + y$; given that $y(0) = 1$, $z(0) = -1$ for $y(0.1)$, $z(0.1)$

UNIVERSITY OF PUNE
[4363]-150
T. E. (Production Engg.) Examination - 2013
PRODUCTION METALLURGY
(Common to Productin S/W)
(2008 Course)

[Time: 3 Hours]   [Max. Marks: 100]

Instructions:

1   *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II*
2   *Answers to the two sections should be written in separate answer-books.*
3   *Neat diagrams must be drawn wherever necessary.*
4   *Black figures to the right indicate full marks.*

SECTION -I

Q.1	A	Explain with neat diagrams the peritectic and eutectoid reactions in the $Fe-Fe_3C$	8
	B	Write short notes: 1) Etching mechanisms 2) Sulphur printing	6
	C	What is macroscopy? What information is obtained by macroscopic studies of components?	4

OR

Q.2	A	Draw microstructures: 1) 0.2% C Steel 2) Widmanstatten structure for hypereutectoid steel 3) 0.8% C Steel	6
	B	Calculate amounts of phases that are obtainable at room temperature if 1.2% C Steel is cooled under equilibrium cooling condition with a suitable diagram. Also define those phases.	6
	C	Give typical composition of the following: 95Cr5Mol, 35NiCr60, En8, AISI9260, St50 and T105Cr1Mn60	6

Q. 3	A	Explain the transformation of Austenite to Pearlite with a neat diagram with its characteristics.	6
	B	State the advantages of Isothermal Annealing over conventional Annealing with a neat diagram.	6
	C	Draw self explanatory diagram for 1) Ausforming 2) Martempering	4

Q. 4	A	Define the Critical Cooling Rate and distinguish between TTT and CCT diagrams.	4
	B	Explain with neat graph the changes taking place during the various stages of tempering	6
	C	Define hardenability and explain the Jominy hardenability test.	6
Q. 5	A	What is carburizing? Why is it done? Is it necessary to carry post carburizing treatments?	6
	B	State the advantages and limitations of nitriding over carburizing.	4
	C	Describe the induction hardening process and give its merits and demerits over the flame hardening process.	6

OR

| Q. 6 | A | Write short notes on: | 16 |

    1) Carbonitriding
    2) Patenting
    3) Austempering
    4) Isoforming

SECTION II

| Q. 7 | A | State effects of following alloying elements on alloy steel: Cr, Va | 4 |
| | B | Write short notes on: | 12 |

    1) White cast iron
    2) Silai and Nicrosilal
    3) Sensitization

| | C | Draw microstructure: | 2 |

    1) Pearlitic gray cast iron

OR

| Q. 8 | A | Write short notes on: | 8 |

    1) Martensitic stainless steels
    2) Heat treatment of 18-4-1 High Speed tool Steel.

| | B | Which alloy steels would you suggest for the following applications and justify: | 10 |

    1) Utensils
    2) Lathe tools
    3) Master tools
    4) Extrusion dies
    5) Plastic moulds

Q. 9	A	Give typical composition, 1 property and 1 application for the following:	12
		1) LM14	
		2) Inconel	
		3) Tinman's Solder	
		4) German Silver	
	B	Wrie shot notes on;	4
		1) Dezincification	
		2) Season cracking of brasses	

<div align="center">OR</div>

Q. 10	A	State the properties of a good bearing material.	4
	B	Give typical composition, 1 property and 1 application for the following;	12
		1) Phosphor Bronze	
		2) Alnico	
		3) Pb-based babbits	
		4) Constantan	

Q. 11	A	Define composites. Classify them and explain particulate composites with suitable diagrams.	8
	B	Write shot notes:	8
		1) Biomaterials	
		2) Different types of fibres	

<div align="center">OR</div>

Q. 12	A	Define :	4
		1) Whiskers	
		2) Prepegs	
		3) Tapes	
		4) Mats	
	B	State the properties and applications of Nanomaterials and Sports materials.	8
	C	A glass fibre reinforced polystyrene contains 40 volume % of parallel fibres. Estimate the Young's modulus of the composite in the longitudinal direction of the fibres. Young's modulus of glass is 70 GN/m^2 and that of polystyrene is 2.6 GN/m^2.	4

[4363]-151
T. E. (Semester - I) Examination -2013
T.E Production (S/W)
M A N U F A C T U R I N G   T E C H N O L O G Y
(2 0 0 8   P a t t e r n)

[Total No. of Questions:12]   **[Total No. Printed Pages:4]**
 [Time : 3 Hours]   **[Max. Marks:100]**

Instructions :

1) *Answer **any three** questions from each I and three questions from section II*

2)*Answers to the **two sections** should be written in **separate answer-books**.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Use oflogarithmic tables, slide   rule, Molliercharts, electronic pocket calculator and steam tables is allowed.*

4) *Assume suitable data, if necessary.*

SECTION –I

Q.1 a) For lon beam machining Draw, schematic diagram & explain in   [8]

   brief. Working principle, state advantages, limitations & applications,

    mention process parameters.

   b) an electro chemical machining of pure iron a material removal   [8]

   rate of 800mm^3/ min is required. Estimate current requirements

OR

Q.1 a) Describe the basic mechanism of material removal (any two)   [16]

   i)   Plasma arch machining

   ii)   Abrasive jet machining

   iii   Laser beam machining

   iv)   Wire cut EDM

   Also identify process parameters.

Q. 2 a) Explain importance of plastic material for product. Which are [12]

    different types of plastic? Enlist characteristics of elastomers.

  b) Write short note on recycling of plastics. [4]

OR

Q 2 a) Explain casting, laminating & re-inforcing for plastic processing [8]

  b) Write short notes on (any two of the following) plastic processes. [8]

    i)   Fastening plastic

    ii)   Foam plastic

    iii)   Thermoforming

    iv)   Elastomers

Q. 3a) Explain in brief need of Micro Elector mechanical systems [mems] [10]

    & Explain various consideration in fabrication of micro-electronic

    devices.

  b) What is Top-down & bottom up manufacturing? Explain it's advantages, [8]

    limitations & applications in brief.

OR

Q.3) Write short notes on following (any three) [18]

    i)   Film deposition

    ii)   Etching

    iii)   Nano technology

    iv)   bonding & packaging

Q.4 a) Explain with neat sketch of Pneumatic comparator [10]

  b) Discuss the desirable characteristics of comparator [6]

OR

Q.4) For measurement by right wave interference explain following [16]
(any two) :

    i)   Michelson interferometer

    ii)   Testing of flat, concave & convex & irregular surfaces.

    iii)   NPL flatness interferometer

Q.5 a) Explain principle & applications of measuring instrument 'optical [8]
protractor'

   b) A 100 mm sine bar is to be set up to an angle 32.5^0. Determine the [4]
slip gauges needed

   c) Write short note on methods of surface finish measurement [4]

OR

Q.5) Write short notes on following (any two) [16]

    i)   Sine bor.

    ii)   Clinometer

    iii) Angle gauges.

    iv) Constant deviation prism.

Q.6a) Explain objectives & functions of cost estimation- [8]

   b) Explain principle factors of estimating cost. with suitable examples. [8]
   c) Indicate densities of following materials (any four): [2]

    i)   Plastic

    ii)   Cast iron

    iii) Steel plate

    iv) Gold

    v)   silver

    vi) Copper

    vii) Wood

OR

Q.6) Write short notes on following (any three)   [18]

    i)   Volume & surface area of solid.

    ii) Methods of depreciation

    iii) Time value of money

    iv) Replacement techniques.

    v) Minimizing manufacturing time with suitable example.

UNIVERSITY OF PUNE
[4363]-154
T. E. (*Production Sandwich*) Examination - 2013
(*Production & Industrial Management-II*)
(*311126*)(*2008 Course*)

[Time: *3* Hours]   [Max. Marks: 100]

Instructions:

    1 *Answers to the **two sections** should be written in **separate answer-books**.*

    2 *Draw neat diagrams wherever necessary.*

    3 *Numbers to the right indicate **full marks.***

    4 *Assume suitable data, if necessary.*

    5 *Use of logarithmic tables, electronic pocket calculator is allowed.*

SECTION -I

UNIT-I

Q.1	A	Explain ABC Analysis.	6
	B	Explain the functions of Marketing Management.	8
	C	What are the different forms of Money?	4

OR

Q.2	A	Explain the difference between Marketing and Selling concept.	8
	B	Explain Law of Diminishing Marginal Utility.	6
	C	Explain Law of Supply.	4

UNIT-II

Q. 3	A	Explain the process sheet design with suitable example.	8
	B	What are the functions of Process engineering?	8

OR

Q. 4	A	Explain in brief Basic manufacturing processes.	10
	B	Differentiate between Special purpose and General purpose Machines.	6

UNIT-III

Q. 5	A	Discuss Standard tooling and Special tooling.	8
	B	Explain Dimensional analysis.	8

OR

Q. 6	A	What is the purpose and utilization of Tolerance chart?	8
	B	Explain 3-2-1 Principle with the help of diagram.	8

SECTION II

UNIT-IV

Q. 7	A	Discuss the factors Affecting Quality	8
	B	Discuss Double sample plan with the help of flow chart	8

OR

Q. 8	A	Draw and explain Operation Characteristic Curve	8
	B	In a work shop a shaft of diameter 50mm is manufactured with a tolerance of ±0.5mm. Four shafts from each and five such batches were investigated. The observations are as given below.	8

	Shafts			
Batch	**1**	**2**	**3**	**4**
1	50.10	50.09	50.13	50.20
2	49.80	50.01	49.91	49.72
3	50.40	50.36	50.13	50.09
4	50.16	49.81	49.90	49.72
5	49.60	49.78	50.13	49.83

Plot the X-bar chart. (Take Standard Deviation as

0.1791)

UNIT-V

Q. 9   A   Write short note on

      i)   Pereto Chart   4

      ii)   Cause & Effect Diagram   6

      iii)   Scatter Diagram   6

OR

Q. 10   A   Name the eight pillars of TPM   4

       B   Explain PDSA Cycle   6

       C   Write short note on Kaizen   6

UNIT-VI

Q. 11   A   Discuss the features of ISO 9000 Standards   8

       B   Explain FMEA   8

       C   Define: Fault Tree Analysis(FTA)   2

OR

Q. 12   A   State advantages and disadvantages of ISO 9000   8

       B   State the elements of Quality System   8

       C   What is "continual improvement"?   2