[03 – 4210]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2011
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS
Time: Three hours   Maximum : 70 marks
Answer Part A and any FOUR questions from Part B & All questions carry equal marks.
Part A must be answered at one place and assume any missing data.

1.   (a)   List the static and dynamic performance characteristic of a measuring

             instrument.

      (b)   Define accuracy and precision w.r.t measuring instrument.

      (c)   List the different methods of measuring pressure.

      (d)   What is vibration? List the instrument available for measuring vibration.

      (e)   What are the important properties of the signal flow graph?

      (f)   List the properties of the state-transition matrix.

      (g)   Define the terms Band width and cutoff rate.

                              PART – A

2.   (a)   Explain how the strain is measured using capacitance type of strain gauge

             with suitable sketch.

      (b)   What is seismographic measurement? Explain the principle of laser

             seismograph with schematic diagram?

3.   A cantilever of spring steel $(E = 2x10^{11}\ N/m^2)$ is used for the force

      measurement. The deflection is measured with a micrometer having a sensitivity

      of $\pm 1\mu m$. The dimensions of the cantilever are Length $= 25 \pm 0.002$ mm,

      width and $= 4 \pm 0.002$mm and $c = 0.75 \pm 0.001$ mm (Where 'c' is half of the

      thickness). Calculate the force and its uncertainty when the deflection is 2 mm.

4.   (a)   Analyze the error in the flow rate measurement caused by the thermal

             expansion of an orifice plate.

      (b)   Explain various electrical methods of measuring temperature.

PART – B

5. (a) Draw a state diagram for the following state equations

$$\frac{dx_1}{dt} = 2x_1 + 3x_2$$

$$\frac{dx_2}{dt} = -5x_1 - 5x_2 + 2r(t)$$

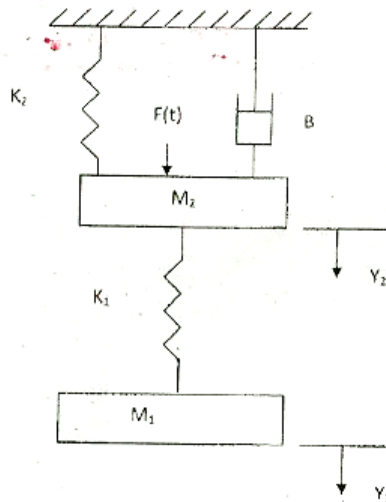Also find the characteristic equation of the system and the transfer functions = x1(S)/R(S) and x2(S)/R(S).

(b) Draw the signal flow graph for the following set of algebraic equations

$$X_1 = -X_2 - 3X_3 + 3$$
$$X_2 = 5X_1 - 2X_2 + X_3$$
$$X_3 = 4X_1 + X_2 - 5X_3 + 5$$

6. (a) What is physical system? Give suitable examples.

(b) Obtain the transfer function $Y_1(S) / F(S)$ and $Y_2(S) / F(S)$ of the Mechanical system shown in fig below.

7. (a) Explain the time domain specifications

(i)   Maximum Overshoot

(ii) Delay time

(iii) Rise time

(iv) Setting time

(b)   The characteristic equation of a closed – loop system is given by $S^4 + 125S^3 + S^2 + 5S + K = 0$. Using the Routh-Hurwitz criterion, determine the range of K for the system stability.

8.   (a)   Explain how the stability of multi loop systems is determined.

    (b)   The forward-path transfer function of a unity-feedback control system is G(S) =5/S(S+6.54). Find the resonance peak, resonant frequency and bandwidth.

[03 – 4208]

IV/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   Define the following terms

            (i)   Deflection factors

            (ii)   Linearity.

     (b)   What is a bonded strain gauge? What are its application?

     (c)   What is a thermocouple? Write its applications.

     (d)   Define transfer function.

     (e)   Define Rouths stability criterion.

     (f)   List the various time domain specifications.

     (g)   What is root locus?

## PART A

2.   (a)   Discuss briefly on the reliability of measurement systems. Explain how
            reliability improvement can be achieved.   (8)

     (b)   "A precise instrument need not be accurate", explain.   (6)

3.   (a)   Differentiate between rare metal thermocouples and base metal
            thermocouples.   (6)

     (b)   Design a measurement system for displacement measurement using LDR
            (Light Dependent Resistor) as sensor.   (8)

4.   (a)   What are the properties of optical fibres?   (7)

     (b)   How laser beams can be used for measurement of length and
            displacement?   (7)

PART B

5.   (a)   What are the advantages of closed loop system over open loop system? (6)

     (b)   Determine the transfer function of the system shown in Fig. 1.   (8)
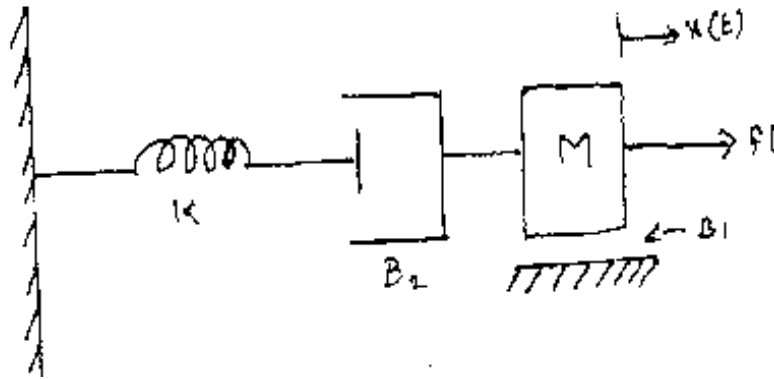
6. (a) State and explain Mason's gain formula for the signal flow graph. (7)

   (b) Determine the closed loop transfer function $\frac{C(S)}{R(S)}$ for the given signal flow graph in Fig. 2. (7)
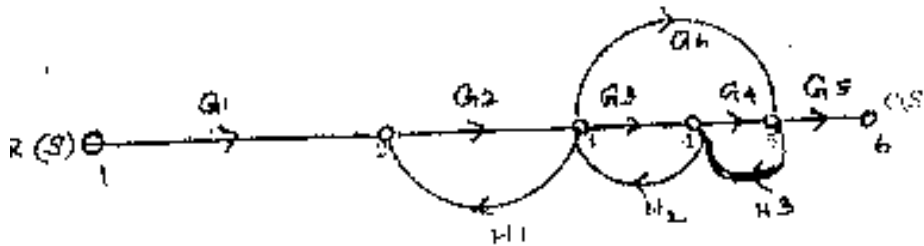
7. (a) Discuss the advantages and disadvantages of frequency response analysis.

   (b) Bring out the correlation between time response and frequency response.

8. (a) What are the necessary conditions to have all the roots of characteristic equation in the left half of S-plane? (4)

   (b) What are the difficulties in Routh Hurwitz stability criterion? Explain how can you overcome them. (10)

[03 – 4203]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2011
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   a)   What is the difference between RAM and ROM?

      b)   What are the parameters that are required to define views?

      c)   Explain the importance of clipping

      d)   State the limitations found in the general wire frame modeling systems.

      e)   Define the terms: nodal point, element and degree of freedom/

      f)   List out various CAD packages and their uses.

      g)   What are the various display control commands available in a drafting
              system?

2. (a) Name the various display devices that are used for displaying digital information?
        Present their merits and demerits.

   (b) Explain briefly various graphic transformations required for initiating the
       geometric information.

3. (a) Explain how do you design work station for CAD operation?

   (b) The two ends of a straight line have coordinates (1, 3) and (2, 5). It is to be
       reflected about a straight line that passes through the points (0, 0.5) and (4, 6).
       Write the necessary transformation matrix for the above operation and determine
       the new coordinates of the end points of the line.

4.   a) Why do you consider studying geometric modeling is important in relation
            to CAD in the manufacturing industry?

      b) Compare 2D and 3D wireframe modeling with respect to their utility for an
         Engineering Industry.

5.   a) What are the various types of analyses that are possible using FEA?

b) A tapering round bar is fixed at one end and a tensile load of 1000 N is applied at the other end as shown in Fig. 1. E= 2 × 10⁵Mpa . Find the global stiffness matrix and displacements considering it as 4 elements.
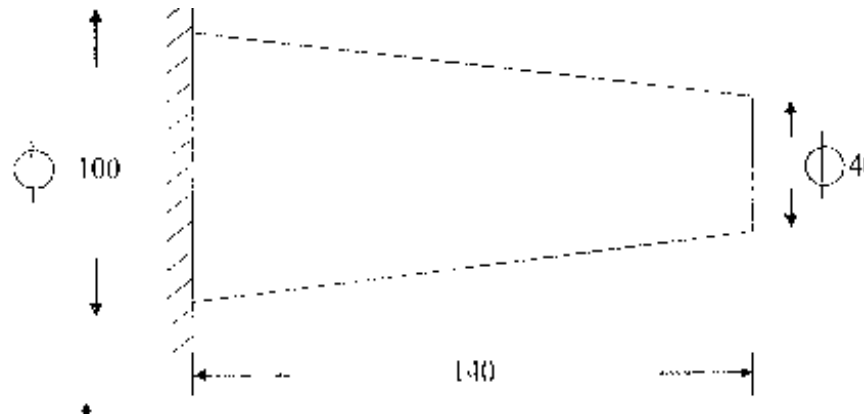
6. a) Explain the various CAD techniques used to finite element data preparation.

    b) Explain CAD application in analysis of centroid and moment of inertia.

7. a) What is Artificial intelligence? Explain application of AI in CAD.

    b) Discuss the CAD applications of FEM.

8. Write short notes on any THREE of the following:

    a) NASTRON

    b) Simple machine elements

    c) 3D solid modelling

    d) CAD system configuration

    e) Hardware in CAD

******

[03 – 4211]

IV/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   a)   Write the names of graphic input, output and display devices used in Computer.

      b)   Explain the functions of a graphics package.

      c)   Write the 3-D transformation matrix for rotation about x,y,z axis.

      d)   What are the various limitations of using wire frame models?

      e)   Write down the parametric equation for the Bezier surface.

      f)   Briefly explain the concept of post processing as applied to finite element method.

      g)   What are the applications of AI in CAD?

2.   a)   Explain how CAD helps to synthesize a product design and do engineering analysis for getting optimal design.

      b)   Explain the applications of computers in design process.

3.   a)   Describe briefly the two basic techniques used in image generation in computer graphics.

      b)   What is the need for concatenation of transformations? Explain what care should be taken in such cases.

4.   a)   Discuss the modeling guidelines to be followed by the user while constructing a surface model on a CAD/CAM system.

      b)   Explain the basic curve fitting techniques.

5.   a)   Explain the significance of node numbering and element numbering during the discretization process.

      b)   Explain the mesh generation schemes for 3-D problems.

6.   a)   Compare the capabilities of ANSYS software with NISA software.

b)   List and sketch the various 3-D solid structural elements available in ANSYS software.

7.   Explain with an example the important steps in the development of a program for design and manufacture of a slider crank mechanism. Give flow chart and expected output.

8.   a)   Discuss the term "Artificial Intelligence". How is it used in CAD?

         b)   Discuss the applications of AI in design and CAD.

[03 – 4210]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time: Three hours   Maximum: 70 marks

Answer Question 1 and any FOUR questions from the remaining & All questions carry equal marks.

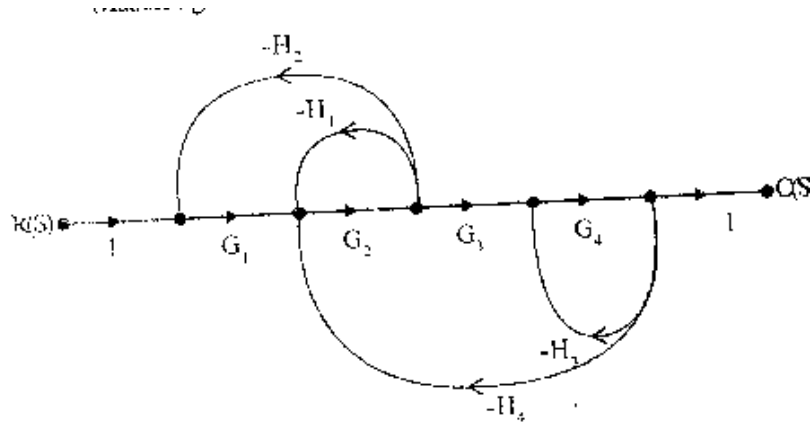Question 1 must be answered at one place and assume any missing data.

1.   (a)   List out the various methods to measure the force.

      (b)   Define static pressure and dynamic pressure.

      (c)   List out the properties of state transition matrix.

      (d)   What are the applications of optical fibers?

      (e)   How does fiber optics work?

      (f)   What are the effects of feedback on the performance of a system?

      (g)   Explain Eigen values and Eigen vectors.

2.   Discuss the dynamic response characteristics of second order instruments to step input. What are peak time and peak overshoot?

3.   (a)   List the gauges for the measurement of high and medium pressures.

      (d)   Explain any one high pressure-measuring device.

4.   (a)   Illustrate applications of feed back control system.

      (b)   What are the effects of feedback on the performance of a system? Briefly explain.

5.   (a)   Draw the signal flow graph of the network given below and find the transfer

             function.
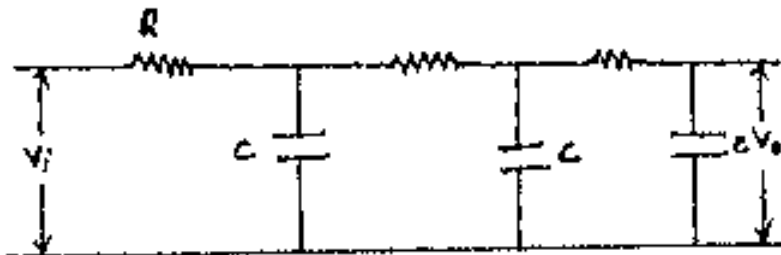
      (b)   Explain the signal flow graph technique with an example.

6. (a)   State and explain Routh stability criterion.

    (b)   Sketch the root locus for the characteristic equation s(s+1) (s+2)+k(s+1.5)=0.

7. (a)   Write the relative merits and demerits of both nyquist and bode plots.

    (b)   Give the transfer function of system is $G(s) = \dfrac{1}{s(1+s)^r}$. sketch the polar plot and find the frequency when $\left|G(j)\right| = 1$ and the corresponding phase angle.

8. (a)   Derive the STM that is required in the solution of the state equation.

    (b)   Reduce the matrix A to diagonal matrix.

    $$A = \begin{bmatrix} 1 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix}$$

[03 – 4210]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time: 3 hours   Maximum: 70 marks

Answer Question 1 and any FOUR questions from the remaining & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.   a)   Define accuracy.

      b)   Write notes on seismographic measurement.

      c)   Explain the temperature measurement.

      d)   Write the Mason's gain formula.

      e)   Define steady-state error.

      f)   Explain the significance of Frequency response.

      g)   Explain sensitivity of an instrument.

2.   a)   Explain fiber optic sensor configuration.

      b)   Explain how length/displacement can be measured optically?

3.   a)   Define and compose open loop and closed loop control system with examples.

      b)   Derive the mathematical model for and armature controlled DC motor.

4.   a)   Define absolute stability and marginal stability.

      b)   The open loop transfer function of a unity negative feedback control system is given by

            $$G(S) = \frac{K(S+2)}{S(S+1)(S+3)(S+5)}$$

            determine the value of K at which the system is just stable with Routh-Hounoitz criterion.

5.   a)   Explain the characteristics needed for measuring an instrument.

      b)   Explain how temperature is measured optically?

6.   For the system described by the signal flow graph shown in fig. 1, obtain the closed loop transfer function $\frac{C(S)}{R(S)}$, using Mason's gain formula.

7. a) Explain Nyquist's stability criterion.

    b) The open-loop transfer function of a unity negative feedback system is given by

    $$G(S) = \frac{K(S+3)}{S(S^2 + 2S + 2)}$$

    Using the Nyquist criteria, find the value of K for which the closed loop control system is just stable.

8. The state model of the system is given by:

    $$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{pmatrix} 0 & 1 \\ -3 & -4 \end{pmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t),$$

    $$\begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad \text{where } u(f) = 0 \text{ for } t < 0$$

    $$= e^{-t} \text{ for } t \geq 0$$

    Obtain the response of the system.

[03 – 4208]

IV/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time : Three hours   Maximum : 70 marks

Answer Question 1 and any FOUR questions from the remaining & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.   a)   List out the static performance characteristics of instruments.

      b)   Define vacuum pressure and absolute pressure.

      c)   What is Seismograph?

      d)   What are the applications of optical fibers?

      e)   How does fiber optics work?

      f)   What are the uses of eigen values?

      g)   What are the applications of the Nuquist criterion?

2.   Draw the block diagram of the measuring system and explain each stage with their functions.

3.   (a)   Explain the use of wire wound potentiometers for the measurement of linear

             and rotary motions. Point out the advantages and limitations of such transducers.

      (b)   How are elastic materials used for force measurements? Explain.

4.   (a)   What are the relative advantages and disadvantages of venture, orifice and flow

             nozzle meters?

      (b)   Briefly explain the properties of fiber optics.

5.   (a)   Describe the closed loop control system with an example.

      (b)   A mechanical system is shown in below figure derive its transfer function.

6.   (a)   Define the steady state error and error constant of different types of inputs.

    (b)   A unit feedback system has a forward path transfer function.

$$G(s) = \frac{9}{S(S+1)}$$

Find the value of damping ratio, undamped natural frequency of the system, percentage overshoot, peak time and setting time.

7.   (a)   What are the merits of state variable technique?

    (b)   State and explain Nyquist stability criterion.

8.   (a)   What are the properties of state transition matrix?

    (b)   Reduce the matrix A to diagonal matrix.

$$A = \begin{vmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{vmatrix}$$

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Question 1 and any FOUR questions from the remaining & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a)   What is a Work station?
    (b)   What is Wire Frame modeling?
    (c)   Define Clipping.
    (d)   What are the various element types used in FEA?
    (e)   Explain one application of AI.
    (f)   What is Windowing?
    (g)   What is solid modeling?

2. (a)   How does a work station differ from PC? Give the minimum configuration of a CAD workstation.
    (b)   Explain the various standards which work at various levels of graphics systems.

3. (a)   What are the capabilities and limitations of directed beam refresh graphics terminal?
    (b)   Write briefly on the secondary storage devices used in CAD system.

4. (a)   Define Geometric model. Explain how a 3-D object is represented by a wire frame model.
    (b)   Distinguish between 2-D and 3-D wire frame models.

5. (a)   Explain the semi automatic mesh generation technique.
    (b)   Explain the two general approaches associated with the FEM for structural problems?

6. (a)   Explain about ANSYS software package.
    (b)   Discuss the analysis of a slider-crank mechanism.

7. (a)   What are the limitations of NASTRAN in static analysis.
    (b)   Explain the use of AI in CAD.

8. (a)   Explain the concept of FEA and FEM modelling.
    (b)   Derive the principal moments of inertia of an object given its moments about a co-ordinate system.

[03 – 4211]

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Question 1 and any FOUR questions from the remaining & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.   (a)   What are the benefits of CAD?
      (b)   What are the applications of computers for design?
      (c)   What do you mean by composite transformations?
      (d)   What are the applications of wire frame models?
      (e)   What is the use of mesh generation in finite element analysis?
      (f)   List the advantages of FEA.
      (g)   What do you mean by post processor?
2.   (a)   Bring out clearly the difficulties a design engineer has to face at each of the
             design stages if they are carried out manually.
      (b)   What are the types of plotters? Explain their working.
3   (a)   What are the functions of an interactive graphic design workstation?
      (b)   What is a digitizer? Explain how it can be used for transferring paper drawing to
             CAD system.
4.   (a)   The vertices of a triangle are situated at points (15, 30), (25, 35) and (5, 45). Find
             the coordinates of the vertices if the triangle is first rotated 100 counter clock
             wise direction about the origin and then scaled to twice its size.
      (b)   Explain Cohen-Sutherland algorithm for clipping of lines.
5.   (a)   Derive the cubic spline equations.
      (b)   Explain the Engineering applications of cubic splines.
6.   (a)   What are the limitations in utilizing the sweep method for geometric
             construction?
      (b)   Explain the basic curve fitting techniques.
7.   (a)   Develop an algorithm that can enable the user to create and manipulate
             boundary model by using set operations.
      (b)   Explain the basic elements used in finite element analysis.
8.   (a)   Explain how to analyze the cross sectional area, centroid of a mechanical
             element with an example.
      (b)   Explain the applications of artificial intelligence in CAD and CAM.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   What are the various types of models?

     (b)   Name two applications of FEM.

     (c)   What is meant by combined transformation?

     (d)   Explain windowing.

     (e)   What do you understand by artificial intelligence?

     (f)   Give two benefits of CAD.

     (g)   What do you understand by interactive computer graphics?

2.   (a)   Explain the types of hardware used in CAD applications.

     (b)   What are the various modelling techniques used in CAD? Differentiate them.

3.   (a)   What is transformation in CAD? Explain.

     (b)   Explain the calculation o f centroid of a rectangle.

4.   The vertices of a triangle are situated at point (20, 40); (30, 45); and (10,55). Find the coordinates of the vertices if the triangle is first rotated 10° counter clock wise direction about the origin and then scaled to twice its size.

5.   (a)   Explain the salient features of NASTRON package.

     (b)   List the applications AI in design and CAD.

6.   Explain the analysis of cross sectional area and moment of inertia of an I-section of known dimensions.

7.   Discuss the kinematics of four bar mechanism.

8.   Write notes on Geometric modelling; CAD date base and automatic mesh generation.

[03 – 4203]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   What are the various interactive input device in CAD.
      (b)   What is the difference between modeling and viewing.
      (c)   Why is it important to remove hidden lines and surfaces from 3D geometry.
      (d)   Explain the coons and Bezier surfaces.
      (e)   State the functions served by a post processor in FEM.
      (f)   What is Artificial Intelligence.
      (g)   What is the need for concatenation of transformations.
2.   (a)   Explain the following aspects with reference to CAD applications.
             (i) Operating system   (ii)   Hardware.
      (b)   Explain the various benefits of CAD.
3.   (a)   Explain the importance of clipping. Give details of methods used for line clipping.
      (b)   The two ends of a straight line have coordinates A(0.5, 1.5) and B(1, 2.5). The line must be rotated through 40^0 in the counter – clockwise direction about the origin in the XY plane and them translated 4 units in the +X direction. Write the necessary transformation matrix and determine the new coordinates of the two end points.
4.   (a)   Specify the three principal classifications of the geometric modeling systems and write in brief about each of them.
      (b)   What are the limitations found in the general wire frame modeling system? Explain with an example.
5.   (a)   What are the steps to be carried out for solving a physical problem with the help of FEM software?
      (b)   State different phases of finite element analysis. Explain how these phases are implemented in NISA-II.
6.   (a)   Explain CAD applications in Crank slider. Mechanism.
      (b)   Discuss the CAD applications of FEM.
7.   (a)   Explain CAD application in analysis of cross sectional area.
      (b)   What is automatic mesh generation? Explain interactive mesh generation methods.
8.   Write short notes on any THREE of the following:
      (a)   Surface modeling.
      (b)   Graphics standards.
      (c)   Benefits of CAD.
      (d)   ANSYS.
      (e)   Computer aided drafting.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
ENGINEERING ECONOMICS

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   What is Value?

      (b)   What is a Partnership company?

      (c)   What is process costing?

      (d)   What is meant by agents of production?

      (e)   What is Unit costing?

      (f)   Define Process costing.

      (g)   What is a Balance sheet?

2.   Explain the concept of Elasticity of Demand.

3.   How is price determined under monopoly? Explain with suitable diagram.

4.   Explain various methods of distribution of Overhead costs.

5.   What is monopolistic competition? Explain its important features.

6.   (a)   Explain the Laws of Returns.

      (b)   Distinguish between perfect and imperfect markets.

7.   Mr. X has taken a shop on rent at an Industrial exhibition site. The rent of the shop for the total period of exhibition i.e. 45 days is Rs. 4,000. He sells rocket toys R.24/- per piece and the variable cost per rocket is Rs.16/-. Calculate the break even point. Also calculate level of sales to get a profit of 10% on selling.

8.   From the following balance extracted from the books of M/s. Keela & Associates, pass the necessary closing entries, prepare a Trading and Profit and Loss Account and a Balance sheet.

		Rs.
Opening stock	--	1,250
Sales	--	11,800
Depreciation	--	667
Commission (Cr)	--	211
Insurance	--	380
Carriage Inward	--	300
Furniture	--	670
Printing charges	--	481
Carriage outwards	--	200
Capital	--	9,228
Creditors	--	1,780
Bills Payable	--	541
Plant and Machinery	--	6,230
Returns outwards	--	1,380
Cash in hand	--	895
Salaries	--	750
Debtors	--	1.905
Discount (Dr.)	--	328
Bills receivable	--	2,730
Wages	--	1,589
Returns Inwards	--	1,659
Bank overdraft	--	4,000
Purchases	--	8,679
Petty cash in hand	--	47
Bad debts	--	180

[03 – 4212]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
ENGINEERING ECONOMICS

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   Laws of demand.
      (b)   Agents of production.
      (c)   Monopoly.
      (d)   Crossing of cheques.
      (e)   Overhead costs.
      (f)   Job costing.
      (g)   Methods of depreciation.

2.   What are the different types of elasticity of demand?

3.   Outline the characteristics of sole trader business.

4.   Briefly explain how price of a commodity is determined under perfect competitive market.

5.   Define 'cost'. What are the various elements of cost?

6.   Outline the objectives of break even analysis.

7.   Distinguish between private limited company and pubic limited company.

8.   You are asked to calculate the depreciation for the first three years under sum of years digit method. Mrs. Govind & Co. purchased an asset for Rs. 2,10,000. Estimated life of the asset is 6 years. The scrap value of an asset is estimated for Rs. 10,000.

[03 – 4206]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
Effective – COMPUTER AIDED MANUFACTURING

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   Explain absolute and incremental positioning systems.
      (b)   List out the advantages of group technology.
      (c)   What are various features of CNC machining center?
      (d)   Briefly explain the features of a DNC system.
      (e)   What are the basic steps involved in designing a quality control system?
      (f)   List the advantages of FMS.
      (g)   State the applications of CMM.
2.   (a)   Describe the Binary coded decimal system used in NC machines for part
             programming.
      (b)   Why is parity check provided in NC punched tapes?
3.   Explain the following:
      (a)   Composite component.
      (b)   Design and manufacturing attributes.
      (c)   Hybrid structures.
4.   (a)   Explain machine cell design in group technology.
      (b)   What are the advantages of CAPP over manual process planning? Explain in
             detail.
5.   (a)   What are the various types of AGV's that are used in automation manufacturing?
      (b)   Explain briefly the data requirements of MRP?
6.   (a)   Explain general types of non-optical, non-contact inspection methods.
      (b)   What are the objectives of CAGC? Explain.
7.   (a)   How does CIM integrate all activities of industry? Explain.
      (b)   In which type of production, FMS is applied? What are the advantages of FMS?
8.   (a)   Define Total Quality Management (TQM) and explain its relevance to CIM.
      (b)   Explain with a block diagram the computer – Integrated – production – planning
             control – system.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
Effective – COMPUTER AIDED MANUFACTURING

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   What is adaptive control system?
        (b)   Define the term "Group Technology".
        (c)   What are the steps in APT?
        (d)   List the general types of non-optical, non-contact inspection methods.
        (e)   What is computer integrated manufacturing?
        (f)   What are the objectives of CAQC?
        (g)   List the basic features of FMS.
2.   (a)   Differentiate between
                 (i)   NC, CNC and DNS system.
                 (ii)   ACC and ACO adaptive control system.
        (b)   Describe the parts classification and coding system. Enumerate advantages of Group technology.
3.   (a)   Write the steps involved in production flow analysis. Why do you carry out such analysis?
        (b)   Briefly explain the methodology to be followed for developing a generative type CAPP system.
4.   Define the following terms in respect of industrial robots.
        (a)   Work space
        (b)   Dextrous work space
        (c)   Accuracy and repeatability.
5.   (a)   Describe a material handling system.
        (b)   What are the major elements of an ASRS? Explain.
6.   (a)   Discuss the principle of variant process planning.
        (b)   With the help of a block diagram explain the different sub-modules of a typical MRP system.
7.   What are the objectives of CAQC? Explain the different computer aided inspection methods.
8.   (a)   In which type of production, FMS in applied? What are the advantages of FMS?
        (b)   Distinguish between Automation and Computer integrated manufacturing.
        (c)   Explain briefly the scope of computer integrated manufacturing.

[03 – 4209]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
OPERATIONS RESEARCH

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a)   Name the various methods for solving operations research models.
    (b)   Explain degeneracy in simplex method.
    (c)   Explain the principle of duality in linear programming problems.
    (d)   Briefly describe transportation problem.
    (e)   What are the costs associated with inventory.
    (f)   Define the following with respect to game theory:
          (i)   Pure strategy.
          (ii)   Saddle points.
          (iii) Mixed strategy.
    (g)   How do you evaluate standard deviation for networks.

2. (a)   Define and explain optimum solution and feasible solution of a Linear
          programming problem (LPP).
    (b)   Find the optimum solution for the following L.P. Problem using simplex method.
          Maximize $Z = y_1 + 2y_2$
          Subject to $3y_1 + 2y_2 \le 12$
                        $2y_1 + 3y_2 \ge 16$
                        $y_1 \ge 0$ *and* y_2 is free in sign.

3. (a)   Define the dual of linear programming problem.
    (b)   State the essential differences between simplex method and dual simplex method.
    (c)   A firm makes three products A, B and C. Each product requires production in
          each of the three departments show below:

          Product   Time taken per unit (in hours)
                        Dept. – I   Dept. – II   Dept. – III

          A   3   2   1
          B   4   1   3
          C   2   2   3

Total time available is 60 hours, 40 hours and 30 hours in Departments I, II and III
respectively. Product A contributes Rs.2 per unit and products B and C. Rs. 4 and Rs.2.50
respectively.

Write the dual of this problem and give its economic interpretation.

4. (a) Find the basic feasible solution for the transportation problem:

To↙From		Destination Y			Supply
	1	2	3	4	
1	15	0	20	10	50
Origin 'I' 2	12	8	11	20	50
	6	16	14	18	100
3					
Demand	30	40	60	70	

(b) Formulate an Assignment problem as linear programming problem. Why do you need to have a separate technique to solve this problem rather than using simplex technique.

5. (a) Why do you understand by the following terms in the context of sequencing of jobs?

(i) Job arrival pattern.
(ii) Number of machines and
(iii) The flow pattern in the shop.

(b) A company has four jobs which must go through machines X, Y and Z in the order XYZ. The processing time are:

	Machine		
Job	X	Y	Z
1	30	80	40
2	120	100	60
3	50	90	50
4	20	60	120

What should be the sequence of the jobs?

6. (a) A factory has a large number of bulbs, all of which must be in working condition.

The mortality of the bulbs is given in the following table.

Week	Proportion of bulbs failing during the week
1.	0.10
2.	0.15
3.	0.25
4.	0.35
5.	0.12
6.	0.03

If bulbs fails in service, it costs Rs.3.50 to replace but if all bulbs are replaced at a time it cots Rs.1.20 each. Find the optimum group replacement policy, assuring that there are 1000 bulbs initially in the system.

(b)   What is replacement? Explain how the theory of replacement is used when the replacement of items that fail completely.

7.   (a)   What is zero sum two person game? Show how a game can be formulated as a

L.P.P.

(b)   Use the concept of dominance to reduce the size of the given problem to 2 x 3 matrix and solve the game:

Player – B

$$\text{Player} - \text{A} \begin{vmatrix} 1 & 8 & 3 \\ 6 & 4 & 5 \\ 0 & 1 & 2 \end{vmatrix}$$

8.   (a)   An item has annual demand of 25,000 units. Its ordering cost is Rs.20 per order and inventory carrying cost is 15% per annum per Rupee invested. The price per unit of this item is Rs.12. What is the EOQ?

`   (b)   Determine the critical path, expected duration of the project and variance for the following:

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	2	8	8
1-3	2	5	8
1-4	3	3	9
2-5	2	2	2
3-5	3	6	15
4-6	3	6	9
5-6	4	7	16

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
OPERATIONS RESEARCH
Time: Three hours   Maximum: 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Explain briefly the main characteristics and phases of O.R. study.
   (b) What do you understand by graphical method of L.P.P? Give its limitations.
   (c) What is the difference between a slack and surplus variables?
   (d) Describe an unbalanced Transportation problem.
   (e) What is Travelling Salesman problem?
   (f) What are the various replacement models?
   (g) What is Economic order interval for single items?

2. (a) Explain the simple method.
   (b) Solve the following L.P.P. by simplex method

   Maximize $Z = 3x_1 + 2x_2$

   Subject to $2x_1 + 3x_2 \leq 90$

   $3x_1 + 4x_2 \leq 120$

   $x_1, x_2 \geq 0$

3. (a) Find the starting solution in the following transportation problem by the north west corner method.

		Costs			
10	20	5	7	10	
13	9	12	8	20	
4	15	7	9	30	Supply
14	7	1	0	40	
3	12	5	19	50	
Demand 60	60	20	10		

   (b) Solve the following assignment problems.

		Tasks			
		I	II	III	IV
	1	8	26	17	11
Workers	2	10	28	01	26
	3	38	19	18	15
	4	19	26	24	10

4.   (a)   Describe the replacement problem whose maintenance costs increase with time.

        (b)   The cost of a machine is Rs. 6,100 and its scrap value is only Rs. 100. The maintenance costs are found from experience to be

Year :	1	2	3	4	5	6	7	8

Maintenance Cost in Rs:	100	250	400	600	900	1250	1600	2000

            When should machine replaced?

5.   (a)   Determine a sequence for five jobs that minimizes the lapsed time.

Processing Time

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

        (b)   Explain how you would solve a job-sequencing problem by graphical method.

6.   (a)   What do you understand by a queue? Give some applications of queuing theory.

        (b)   A two channel waiting line with poisson arrival has a mean arrival rate of 50 per hour and Exponential service with a mean service rate of 75/per hour for each channel.

            Find :

            (i)   the probability of an empty system

            (ii)   the probability that an arrival in the system will have to wait.

7.   (a)   Explain minimax (maximum) criterion in game theory.

        (b)   Solve the rectangular game with pay-off matrix.

$$\begin{bmatrix} -3 & 4 & 2 & 9 \\ 7 & 8 & 6 & 10 \\ 6 & 2 & 4 & -1 \end{bmatrix}$$

8.   (a)   Explain clearly the various costs that are involved in inventory problems. How they are inter related?

        (b)   A company uses annually 12,000 units of a raw material costing Rs. 1.25 per unit Placing each order costs 45 paise and the carrying costs are 15% per year per unit of the average inventory. Find the economic order quantity.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
AUTOMOBILE ENGINEERING

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   List the various types of vehicles.
      (b)   What are the advantages of friction clutch?
      (c)   What is steering stop?
      (d)   What are the functions of tyres?
      (e)   Define caster angle.
      (f)   What are the advantages and disadvantages of hydraulic brakes over mechanical
             brakes?
      (g)   Which material is used for exhaust manifold?

2.   Discuss the various functions of an internal combustion engine piston. Draw the neat
      sketch of the piston showing various parts. Discuss the different types of material used
      for manufacturing of pistons with their relative merits and demerits.

3.   (a)   What is super charging in S.I. engine? Draw and explain any two types of super
             chargers used in S.I. engines.
      (b)   What do you understand by term muffler ? Why an automotive require muffler?
             With the help of suitable diagrams explain various types of mufflers used in
             automobiles.

4.   Explain in detail different tests to which lubricants are subjected. How do you determine
      viscosity of lubricating oil?

5.   (a)   Describe clearly how you treat the engine exhaust gases to convert the
             pollutants there into harmless constituents.
      (b)   Discuss in detail, the following techniques of reducing the pollutants in the
             exhaust gases:
             (i)   Air injection system.
             (ii)   Pulse air injection reactor system.

6.   (a)   Explain in detail the effect of automotive emissions on human health.
      (b)   Discuss the advantages of electronic ignition system compared to the
             conventional ignition system.

7.   (a)   Describe the overrunning clutch type starting drive.
      (b)   Name two types of a propeller shaft and describe one type in detail.

8.   (a)   Discuss the causes and remedies for the following troubles of the rear
             suspension.
             (i)   Loss of cushioning effect and comfort.
             (ii)   Noisy shock absorber.
             (iii) Noise.
      (b)   Describe briefly the different types of steering gears.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
POWER PLANT ENGINEERING

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   (a)   What do you understand by steam jet draught? Where is it generally employed?
      (b)   What factors must be considered while selecting a site for a diesel power plant?
      (c)   State the advantages and disadvantages of gas turbine power plants over diesel and thermal power plants.
      (d)   What safety measures need to be taken for the safe operation of an hydro-electric plant?
      (e)   What is a moderator? Name common moderators and discuss their advantages and limitations.
      (f)   Give the working of a geothermal plant.
      (g)   Discuss the economic loading of combined steam and hydro-plants.
2.   (a)   Describe with a neat sketch the working of a travelling grate stoker of a steam boiler.
      (b)   Make a list of advantages and disadvantages of stoker firing and briefly explain the working of chain grate stoker with simple sketch.
3.   (a)   What are the advantages and disadvantages of diesel power plant over steam power plant? What is the status of diesel power plants in our country.
      (b)   What do you mean by breeder reactor? Describe the working of a Fast breeder reactor.
4.   Describe, with the help of a neat sketch, the working of a pressurized water reactor plant. What are its advantages and disadvantages?
5.   Explain the working of combined hydro and steam plants. Under what circumstances will you classify them as peak load and base load plants?
6.   (a)   How are nuclear power plants classified? Explain how fission reaction takes place and how the chain reaction is controlled.
      (b)   Discuss briefly boiling water reactor plant.
7.   (a)   Write a short on the possibility of the utilization of solar energy for power generation in India.
      (b)   Discuss briefly the advantages combined working of different types of power plants.
8.   What is meant by power plant economics ? Explain. What are fixed and operating costs.

[03 – 4207]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2012
MECHANICAL ENGINEERING
ELECTIVE – STATISTICAL QUALITY CONTROL

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.
Part A must be answered at one place and assume any missing data.

1. a)   What is quality cost?
    b)   What is process capability?
    c)   What is consumer's risk?
    d)   What is standard deviation?
    e)   Explain, how a control chart is useful to control the process?
    f)   What is standard deviation?
    g)_   What is Group control chart?

2. a)   Why industries are preferring attribute charts comparative variable charts,

          explain with example.

    b)   Construct x(bar)and R chart for the following data on the basis of sample size 5.

Sample No	1	2	3	4	5	6	7	8	9	10	11	12
Sample average size	69.4	63.4	57.0	64.0	57.4	82.0	85.0	33.4	46.0	112.4	93.6	95.6
Sample	45	48	62	48	36	81	78	42	69	84	48	75

3. a)   Distinguish between specification and control ((or) action) limits. Show that the

          control limits can be used to improve the specification limits.

    b)   The following table gives the number of missing air washers noted at aircraft final
          inspection.

Air plane No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of missing washers	10	11	09	08	12	07	20	16	13	14	15	12	18	25	26

Find & compute trail limits, and plot control charts for C. What values of C would you suggest for the subsequent period?

4.   a) A certain product is given 100% inspection as it is manufactured and the resultant data are summarized by the hour. In the following table, 16 hours of data are recorded. Calculate the control limits using 3σ control limits and indicate the values that are out of control.

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
No. of units inspected	48	36	50	47	48	54	50	42	32	40	47	47	46	46	48	39	720
No. of defective units	5	5	0	5	0	3	0	1	5	2	2	4	1	0	3	0	36

b) Explain about slanting line control chart and Group control chart.

5.   a)   What do you understand about the acceptance sampling procedures? State its

               uses giving illustrations.

        b)   The following double sampling plan has been proposed for the given data.

                i)   Select a sample of 2 from a lot of 20. If both articles inspected are good, accept the lot. If both are defective, reject the lot. If 1 is good and 1 is defective, take a second sample of one article.

                ii)   If the article in the second sample is good, accept the lot. If it is defective reject the lot If a lot 25% defective is submitted, what is the probability of acceptance? Compute this by the method that is theoretically correct rather than an approximate method.

6.   a)   What is multiple sampling plane? Explain and what are its disadvantages?
        b)   Discuss sequential plan in detail.
7.   a)   What is the importance of reliability for the industrial products?
        b)   Write short notes on system reliability, availability and maintainability.
8.   Write short notes on any TWO of the following:
        a)   Quality costs.

        b)   Rectifying inspection.

        c)   Type – I and Type – II errors in control charts.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

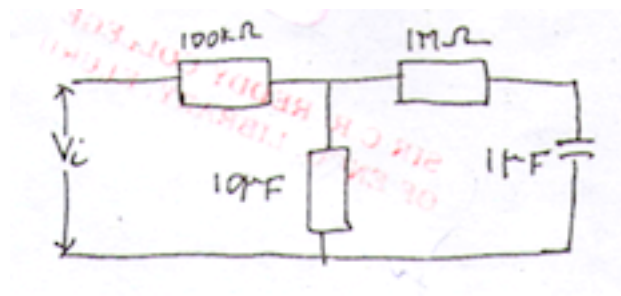Time: Three hours   Maximum: 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
       a)   What are the various torque measurement instruments?
       b)   What are the temperature sensors?
       c)   What is the use of the transfer function?
       d)   List the factors on which the accuracy of an instrument depends.
       e)   What are Eigen values and Eigen vectors?
       f)   What are time delays in a linear control system?
       g)   List the properties of state Transition Matrix.

2.
       a)   List the various methods of measuring low and high temperatures. Explain any one of the methods.
       b)   Write about Seismographic measurement.

3.   Write Brief note on
       a)   Displacement measurement using optical methods.
       b) Vibration measuring methods.

4.
      a)What is the difference between intrinsic and extrinsic types of sensors?
      b)Explain the principles of working of a fiber optic sensor.

5.
       a)   What are the important properties of signal Flow Graph?
       b)   Determine the Closed loop transfer function of the following system.

6.
      a)Derive the transfer function of armature controlled DC servo motor.
      b)   Determine the transfer function for the electrical network shown below.

7.

   a) Define Steady state error. Calculate the steady state errors for various standard test signals.
   b) What is the state of damping for the system having the following transfer function ?

(i) $G(s) = \dfrac{2s + 1}{s^2 + 2s + 1}$

(ii) $G(s) = \dfrac{3s + 20}{s^2 + 2s + 20}$

8.

   a) Describe Routh's stability criterion for stability. State its limitations.
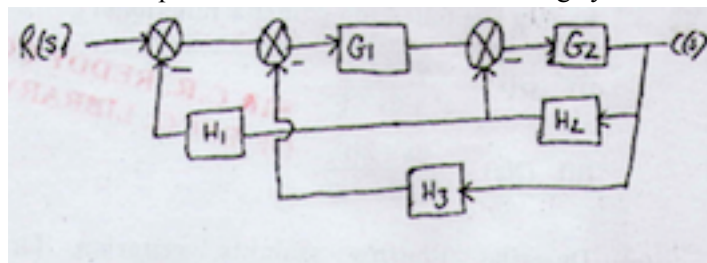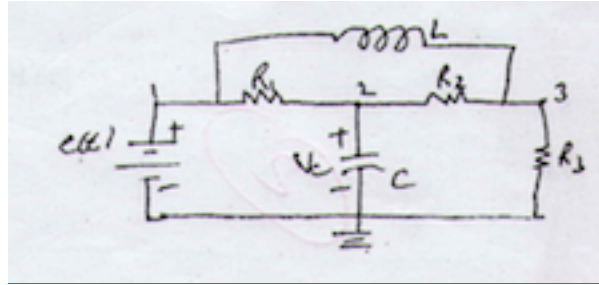   b) Sketch the polar plot of the transfer function
      $$G(s) = \dfrac{10}{s(s+1)}$$

[03 – 4208]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time: Three hours   Maximum: 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.   a) What are the various torque measurement instruments?
        b) What are the temperature sensors?
        c) What is the use of the transfer function?
        d) List the factors on which the accuracy of an instrument depends.
        e) What are Eigen values and Eigen vectors?
        f) What are time delays in a linear control system?
        g) List the properties of state Transition Matrix.

2.
    a)   List the various methods of measuring low and high temperatures. Explain any one of the
          methods.
    b)   Write about Seismographic measurement.

3. Write Brief note on
    a)   Displacement measurement using optical methods.
    b)   Vibration measuring methods.

4.
    a) What is the difference between intrinsic and extrinsic types of sensors?
    b) Explain the principles of working of a fiber optic sensor.

5.
    a)   What are the important properties of signal Flow Graph?
    b)   Determine the Closed loop transfer function of the following system.

6.
    a)   Derive the transfer function of armature controlled DC servo motor.
    b)   Determine the transfer function for the electrical network shown below.

7.

a) Define Steady state error. Calculate the steady state errors for various standard test signals.

b) What is the state of damping for the system having the following transfer function ?

(i) $G(s) = \dfrac{2s + 1}{s^2 + 2s + 1}$

(ii) $G(s) = \dfrac{3s + 20}{s^2 + 2s + 20}$

8.

a) Describe Routh's stability criterion for stability. State its limitations.

b) Sketch the polar plot of the transfer function

$G(s) = \dfrac{10}{s(s+1)}$.

[03 – 4211]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum: 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
    a)   What is a manufacturing database?
    b)   What is Windowing?
    c)   What is surface modeling?
    d)   What are the various element types used in FEA?
    e)   What   is GUI?
    f)   What is mesh generation?
    g)   What is the importance of AI in CAD?

2.
    a)   Explain the requirements for a graphic database.
    b)   How does a work station differ from PC? Give the minimum configuration of a CAD workstation.

3.
    a)   Explain with the help of a block diagram the hardware structure of a CAD work station.
    b) What is meant by interactive computer graphics? Explain its various elements.

4.
    a) Describe various commonly used primitives for solid modeling and explain the Boolean operations.
    b) Describe the properties that a solid model should capture mathematically.

5.
    a)   Explain the two general approaches associated with the FEM for structural problems
    b)   Describe the characteristics of shape functions.

6.
    a) Explain about NISA-II software package.
    b) Discuss the analysis of a slider-crank mechanism.

7.
    a) What are the draw backs of ANSYS in modeling?
    b) Explain the use of AI in CAD.

8.
    a)   Derive the principal moments of inertia of an object given its moments about a co-ordinate system.
    b) Explain the concept   of FEA and FEM modeling.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
   a) What is a work station?
   b) What is wire frame modeling?
   c) Define clipping.
   d) What are the various element types used in FEA?
   e) Explain one application of AI.
   f) What is Windowing?
   g) What is solid modeling?

2.
   a) How does a work station differ from PC? Give the minimum configuration of a CAD work station.
   b) Explain the various standards which work at various levels of graphics systems.

3.
   a) What are the capabilities and limitations of directed beam refresh graphics terminal?
   b) Write briefly on the secondary storage devices used in CAD system.

4.
   a) Define Geometric model. Explain how a 3-D object is represented by a wire frame model.
   b) Distinguish between 2-D and 3-D wire frame models.

5.
   a) Explain the semi automatic mesh generation technique.
   b) Explain the two general approaches associated with the FEM for structural problems.

6.
   a) Explain about ANSYS software package.
   b) Discuss the analysis of a slider-crank mechanism.

7.
   a) What are the limitations of NASTRAN in static analysis?
   b) Explain the use of AI in CAD.

8. Write short notes on the following
   a) Database for manufacturing
   b) Geometric modeling
   c) CAD applications of FEM

[03 – 4212]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
ENGINEERING ECONOMICS

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
   a) Define value.
   b) What are laws of demand?
   c) What do you mean by single trader?
   d) What do you mean by perfect competition?
   e) What is unit costing?
   f) Define process costing.
   g) What is balance sheet?
2. What is elasticity of demand? Explain.
3. How is price determined under monopoly? Explain with suitable diagram
4. Explain various methods of distribution of overheads costs.
5. Explain various theories of interest and how rate of interest is determined under these theories
6.
   c) Distinguish between   perfect and imperfect markets.
   d) Explain the laws of returns.
7. A factory manufacturing sewing machines has a capacity to produce 500 machines per year .
   The marginal (variable) cost of each machine is Rs .200 and each machine is sold for Rs.250.
   fixed overheads are Rs .12,000 per year. Calculate the break-even points for output and sales and
   show what profit will result if output is 90% of capacity
8. From the following balance extracted   from the book of M/s Keela & Associates ,pass the
   necessary closing entries ,prepare a trading and profit and loss account and a balance sheet

----

			Rs.
1.	Opening stock	--	1,250
2.	Sales	--	11,800
3.	Depreciation	--	667
4.	Commission (Cr)	--	211
5.	Insurance	--	380
6.	Carriage Inward	--	300
7.	Furniture	--	670
8.	Printing charges	--	481
9.	Carriage outwards	--	200
10.	Capital	--	9,228

11.	Creditors	--	1,780
12.	Bills Payable	--	541
13.	Plant and Machinery	--	6,230
14.	Returns outwards	--	1,380
15.	Cash in hand	--	895
16.	Salaries	--	750
17.	Debtors	--	1,905
18.	Discount (Dr.)	--	328
19.	Bills receivable	--	2,730
20.	Wages	--	1,589
21.	Returns Inwards	--	1,659
22.	Bank overdraft	--	4,000
23.	Purchases	--	8,679
24.	Petty cash in hand	--	47
25.	Bad debts	--	180

[03 – 4206]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
COMPUTER AIDED MANUFACTURING

Time : Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.

   a) What do you mean by Fixed zero and Floating zero?
   b) Briefly explain the various elements of a NC system.
   c) Briefly explain the features of a DNC system.
   d) What do you understand by the term group technology?
   e) State the applications of CMM.
   f) What are the basic steps involved in designing a quality control system?
   g) List the advantages of FMS.

2.

   a) What is machining center? Explain its features.
   b) What is Adaptive control of machines? Explain.

3.

   a) What is meant by classification and coding approach? How it is different from the GT
       approach?
   b) What is the need of part analysis? Explain.

4.

   a) What are the various approaches available for computer aided process planning?
   b) Explain a generative process planning system.

5.

   a) Explain the various types of materials handling systems.
   b) Explain the structure of a pick and place robot used in industries.

6.

   a) Explain the components of an AGV system.
   b) Explain the objectives of MRP.

7.

   a) Explain the procedure for integration of CAD/CAM with inspection systems.
   b) Explain the applications of CMM.

8.

   a) Explain the principle components of FMS.
   b) Explain Tool management system.

[03 – 4205]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
Elective-II: OPTIMIZATION OF DESIGN

Time : Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
   a) Give the statement of optimization problem.
   b) What is a design space?
   c) State the necessary and sufficient conditions for the minimum of a function.
   d) Define Fibonacci numbers.
   e) What are the characteristics of a direct search methods?
   f) Why is SLP method called the cutting plane method?
   g) What is normality condition in a geometric programming problem?

2. Discuss the engineering applications of optimization.

3.
   a) Find the extreme points of the function
      $f(x_1 ,x_2) = x_1^3 + x_2^3 + 2 x_1^2 + 4 x_2^2 + 6$
   b) Find the dimensions of a cylindrical tin with top and bottom made up of sheet metal to maximize its volume such that the total surface area is equal to 24π.

4.
   a) Find the minimum of $f(x) = x(x-1.5)$ by starting from x=0.0 with an initial step size 0.05.
   b) Explain multivariable optimization with inequality constraints.

5. Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by the cubic interpolation method.

6. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ with the starting point (0,0) by univariate method

7. Minimize $f(x_1, x_2) = x_1 - x_2$ subject to

   $$g(x_1, x_2) = 3x_1^2 - 2x_1x_2 + x_2^2 - 1 \leq 0$$

   By using the cutting plane method. Take the convergence limit as 0.02.

8. Write notes on geometric programming; dynamic programming and integer programming.

[03 – 4207]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2013
MECHANICAL ENGINEERING
Elective-II: STATISTICAL QUALITY CONTROL

Time: Three hours   Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.
    a)   What are the benefits of SQC?
    b)   Explain the use of control chart.
    c)   What are Type I errors in control charts?
    d)   What is demerit rating?
    e)   What do you mean by sensitivity of a chart?
    f)   What do you mean by single sampling plan?
    g)   What is reliability?

2. Ten samples are studied.   Sample size is 5.

Sample No	1	2	3	4	5	6	7	8	9	10
Sample Average Size	25.1	24.9	25.4	25.3	24.7	24.5	24.8	25.4	25.6	25.5
Sample range	0.3	0.4	0.5	0.3	0.4	0.6	0.7	0.4	0.7	0.6

Assume the required constants suitable. Construct $\bar{X}$ and $\bar{R}$ chart.

3.
    a)   What are types II ERRORS in control charts explain?
    b)   Discuss process capability with respect to statistical quality control.

4.
    a)   What is np chart? Discuss.
    b)   What does K4chart mean? Explain its importance in statistical quality control.

5.
  a) In a manufacturing process, the number of defectives found in the inspection of 15 loads of 400 items each are given below:

Lot No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No of defectives	2	5	0	14	3	0	1	0	18	8	6	0	3	0	6

  b) Discuss single sampling plan in detail.

6.

    a)   Explain the characteristics of OC curve.

    b) A single sampling plan has n=110 and c=3 the lot size is large in comparison with small size. Compute the approximate probabilities of acceptance of lots 0.5%,1%,2%,3%,4%,5%,6% and 8% defective.

7.

    a)   Explain the basic elements of reliability.

    b)   For the following data choose suitable single and double sampling plans:

           N=900, LTPD =50% , β=0.1, process average =0.75%

    Explain the work of both plans.

8.   Write notes on any three of the following

        a)   Group control chart

        b)   Multiple and sequential sampling plans

        c)   Maintainability.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) Name two applications of the CAD.
    b) What is windowing?
    c) Write the homogenous transformation matrix for two dimensional rotations.
    d) What do you mean by concatenation?
    e) What are the various types of modeling techniques?
    f) List four finite element method applications.
    g) Why automatic mesh generation is required in FEM?

2.   What are the input devices for graphical workstation? Explain with neat sketches and
     their applications.

3.   a) Explain why homogenous matrix is required for transformations.
      b) Obtain the concatenated matrix while performing rotation operation of a polygon
     (Say Rectangle) about a point other than origin.

4.   Explain different geometric modeling techniques used in computer aided drafting.

5.   Explain the process involved in Finite element analysis with neat flow chart.

6.   a) Explain how Artificial Intelligence is use full in the Computer aided design?

     b) Derive the principal moments of inertia of an object given its moments about a
     coordinate system

7.   What is mesh generation? List out the requirements of mesh in FEA.

8.   Write short notes on

     i) Graphic terminal

     ii) Kinematics of four bar mechanism

     iii) Salient features of analysis packages.

[03 – 4211]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
COMPUTER AIDED DESIGN

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) Write the benefits of CAD
    b) What are the storage devices in CAD?
    c) What are the various display control facilities in graphics?
    d) What are the entities of surface modeling?
    e) Explain the importance of clipping
    f) Name any four FEA software and mention the applications of FEA
    g) Briefly explain the benefits of Artificial intelligence in design

2. a) Explain briefly the design process of CAD. Also mention the applications of computers for design
    b) How does a workstation differ from PC? Give the minimum configuration of a CAD workstation

3. a) Why graphics standards are required for computer graphics? Explain various graphics standards.
b) What is geometric modeling? Briefly explain about the 2D wire frame modeling and 3D wire frame modeling

4. a) What is the difference between windowing and clipping? Explain view generation with an example
b) Explain in detail Cohen – Sutherland clipping algorithm

5. a) Write in detail about translation, scaling and rotation with reference to computer graphics.
b) The two ends of a straight line have coordinates A(0.5,1.5) and B (1,2.5). The line should be rotated through 40° in the counter clockwise direction about the origin in XY plane and then translated 4 units in +X direction . Write the necessary transformation matrix and determine the new coordinates of the two ends points.

6. a) What are the steps to be carried out for solving a physical problem with the help of FEA software? Explain.
b) Explain various solution techniques used in FEA. What precautions are to be taken in finite element mesh generation?

7. a) How do you analyze cross sectional area, centroid and moment of inertia of a mechanical element using CAD? Explain through an example.
b) Explain the important step in analysis of coil spring using CAD.

8. a) Explain the salient features of NASTRON CAD package in detail.
  b) Write also short notes on Artificial intelligence and also mention the applications of artificial intelligence in CAD.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
COMPUTER AIDED MANUFACTURING

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) Define CAM.
    b) State features of CAPP
    c) What is GT?
    d) Advantages of FMS
    e) Applications of Robots
    f) What is Automated Guided vehicle?
    g) Define quality control

2. a) Discuss the NC motion control system

   b) List the applications of NC

3. Discuss elaborately different types of NC part programming methods

4. With suitable sketches explain the classification and coding of parts in GT

5. a) Discuss the tool management in FMS

   b) Write the benefits of FMS

6. Elaborate the mechanism of MRP with suitable flow chart

7. How the CAPP is suitable for FMS system – Discuss

8. a) What is adaptive control optimization? Discuss the same with suitable example.

   b) Discuss elaborately about the structure of Robot.

IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
ENGINEERING ECONOMICS

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.a) Define production.
  b) Define wealth.
  c) What is Monopoly?
  d) Define single trade.
  e) What is a cheque?
  f) What is meant by unit costing?
  g) What does a Balance sheet shows?

2. What is law of demand? A Explain the assumptions, advantages and operation of the law of demand.

3. Differentiate partnership and public limited company and state their advantages and disadvantages.

4. a) Explain in detail how the price is determined in perfect competition.

   b) Explain in detail about imperfect competition.

5. Explain about different form of Money, Cheques and Bills of exchange.

6. Explain in detail the concept of Job Costing and process costing.

7. a) Explain about depreciation and what are the different forms of depreciation.
   b) A Lathe is purchased for Rs. 8,000 and the assumed life is a 10years and scrap value is Rs. 2,000. If the depreciation is charged by diminishing balance method. Calculate the percentage by which value of lathe is reducing each year and depreciation fund after 2 years.

8. Explain about profit and loss account in detail with an example and its advantages.

[03 – 4208]
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
INSTRUMENTATION AND CONTROL SYSTEMS

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
    a)   Explain static performance characteristics.
    b)   Explain Thermo electric Thermometry.
    c)   Define properties of Optical Fibres.
    d)   Draw a functional diagram of thermostat controlled home heating system and identify the system parameters and components.
    e)   Explain Mason's gain formula for signal flow graphs.
    f)   Explain steady state error and error constants.
    g)   Explain frequency response from transfer function.

2. (a) A well type manometer is to be used to measure differential pressure in a water flow system. The manometer uses a special bromide liquid of special gravity of 2.95. The well and the tube are of 75mm and 5mm diameters respectively. The scale placed along the tube has no correction factor for the area ratio of the manometer. Calculate the value of this factor which must be multiplied by the manometer reading in mm to find the pressure differential in Kgf/cm$^{2.}$

    b) A rectangular rosette is mounted on a steel plate, which is subjected to load. The following strains are indicated.
      $\varepsilon 1 = 560\ \mu m/m,\ \varepsilon 2 = 150\ \mu m/m$ and $\varepsilon 3 = -475\ \mu m/m$.

Calculate the principal strains and stresses, the maximum shear stress, and the orientation angle of the maximum principal stress.

3.
a) A hot wire anemometer with a time constant T working in constant working mode is to be used to measure velocity fluctuations upto 1 MHz. Discuss the compensation network to achieve this.

b) A positive displacement meter is metering nitrogen at a pressure of 2N/m2 and temperature 35^{0}C. The uncertainties in the gas pressure and temperature measurements are and respectively. The meter has been calibrated so that it indicates volumetric flow with an accuracy of from 30 to 10 m^{3}/s. Calculate the uncertainty in the mass flow rate at the given pressure and the temperature.

4. Discuss the influence of linearly polarized reference beam on the quality of hologram in the study of holo-photo-elasticity.

5.
a) Draw the block diagram of a biological control system when a human hand approaches to an object to grip it.

b) Using Mason's gain formula, determine x_2/x_1 in the block diagram of figure 1.
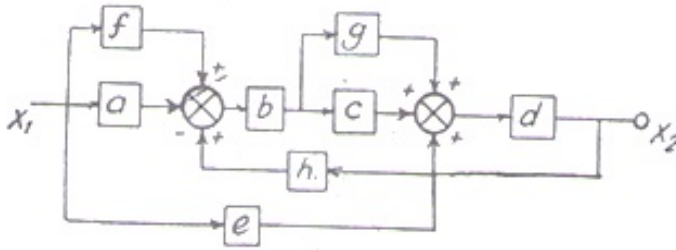
6.
a) Explain the procedure for system transfer function.
b) Determine the transfer function $E_2(s)/E_1(s)$ for the electrical system shown in figure2.
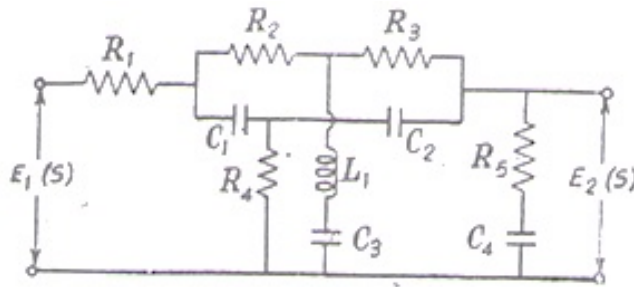
7.
a) Figure 3 shows a system in which a car of mass 1 kg is attached to the wall through the spring. If the spring constant K=144 N/m, the co-efficient of friction f=12 N/sec. meter and the step force applied is 10 Newton. Calculate (i) the final displacement of the car, (ii) the peak displacement of the car and (iii) the duration of time after which the peak displacement is reached.
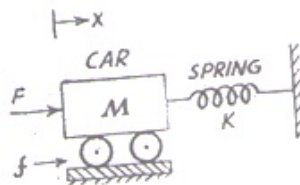
8.
(a) Explain Bode plot and magnitude vs phase angle plot.
(b) Determine the steady state response of the system in figure 4 when the excitation applied is r(i)= 10 sin 8t.
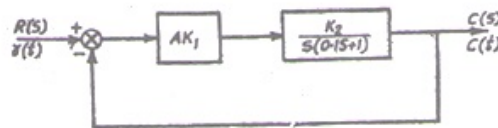
IV/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
STATISTICAL QUALITY CONTROL

Time : Three hours   Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. Write a short notes on
   a)   Quality control.
   b)   What are the control chart parameters?
   c)   What is AQL.
   d)   Define process capability ratio.
   e)   What is critical difference between defect and defective?
   f)   What is system reliability?
   g)   Define acceptance number.
2. Give a comparison between attribute control charts and variable control charts.
3.
   a)   Explain process capability Index and its significances.
   b)   Explain Type –I and Type – II error of control charts.
4.
   a)   Explain construction of p- chart with variable sample size.
   b)   The following data refers to the production and number of defectives on visual inspection
           of 10 samples of size 200. Construct your chart and state your conclusions.

Production numbers	1	2	3	4	5	6	7	8	9	10
Number of defectives	10	14	20	6	8	4	6	4	2	6

5.
   a)   Explain the working of a multiple sampling plan.
   b)   What are the advantages of a multiple sampling plans over simple sampling plan?
6.
   a)   What are the limitations of acceptance sampling?
   b)   Explain the concept of OC curve.
7. a)   Discuss the factors affecting the reliability.
   b)   Fifty artificial heart valves were tested for 10,000 hours at a medical research centre and
           three valves failed during the test. What was the failure rate in terms of
        i. Number of failures
       ii. Number of failures per unit year.
      iii. On the basis of this data how many failures could be expected during a year from the
           installation of these valves in 100 patients.
8. Write notes on any three of the following
   a)   Group control chart
   b)   Demerit rating.
   c)   Sequential sampling
   d)   Bath tub curve

Time: Three hours   Maximum: 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
   a)   What do you mean by instrumentation?
   b)   Define static pressure and dynamic pressure.
   c)   Classify strain gauges.
   d)   What are the applications of optical fibers?
   e)   How does fiber optics work?
   f)   What are the effects of feedback on the performance of a system?
   g)   What are the applications of the Nyquist criterion?

2.   State and explain the desirable static and dynamic characteristics of an instrument.

3.
   a)   Derive the transfer function of a field controlled D.C servomotor and develop the block diagram. Clearly state the assumptions made in the derivation.
   b)   What are the effects of feedback on the performance of a system ? Briefly explain.

4.   Explain in detail the principle components of laser system.

5.
   a)   Briefly explain the terms used in signal flow graph.
   b)   Determine the overall transfer function from the signal flow graph given below.
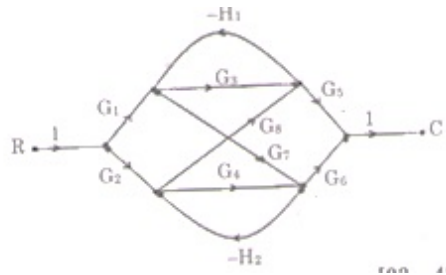
6.
   a)   Show that the Routh's stability criterion and Hurwitz stability criterion are equivalent.
   b)   Consider a unity – feedback control system whose open – loop transfer function
      $G(s)=K/s(J_s+B)$
      Discuss the effects that varying the values of K and B has on the steady – state error in unit-ramp response.

7.   Construct the complete Nyquist plot for a unity feedback control system whose open loop transfer function is
      $G(s)H(s)=K/s(s^2+2s+2)$
      Find maximum value of K for which the system is stable.

8.
   a)   A thermistor has a negative resistance temperature coefficient of 5% over a temperature range of 25^oc. What is the resistance at 35^oc?
   b)   Briefly explain different methods employed to measure torque.