Seventh Semester B.E. Degree Examination, December 2012
## Control Engineering

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

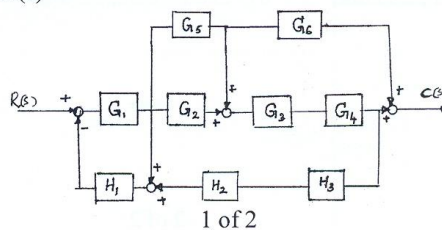1 a. Distinguish between open loop and closed loop control systems, with suitable examples.
                                                                                     (06 Marks)
  b. What are the ideal requirements of control system? Explain.   **(04 Marks)**
  c. What is control action? Briefly explain proportional, proportional plus derivative and proportional plus derivative plus Integral controllers, with the help of block diagrams.
                                                                                (10 Marks)

2 a. Write down the governing equations for the mechanical system shown in fig.Q2(a). Also sketch, equivalent Force – voltage and Force – current circuits using analogues quantities.
                                                                                (13 Marks)

Fig.Q2(a)
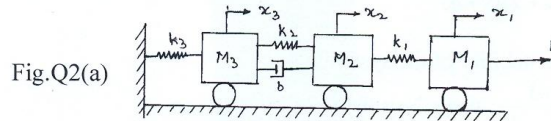
  b. With the help of circuit diagram for armature controlled D – C motor, obtain transfer function, which relates angular displacement, θ of motor shaft to the armature input voltage, e_i.   **(07 Marks)**

3 a. What are basic inputs subjected to control system? Which one is studied exhaustively in your syllabus and why?   **(03 Marks)**
  b. Obtain the expression for response of a second order system subjected to step input, when the damping ratio of the system is less than ONE.   **(08 Marks)**
  c. A under damped second order system is subjected to a step input of 4 units. If the first peak overshoot of 25% occurs at a time equal to 0.8 seconds, determine   **(04 Marks)**
    i) Rise time ii) Settling time iii) Damping coefficient and iv) Natural frequency.
  d. Using R – H criteria, determine the stability of the system whose characteristic equation is given by $S^4 + 8S^2 + 4S + 12 = 0$.   **(05 Marks)**

4 a. Reduce the block diagram given in fig. Q4(a) using block diagram reduction techniques and obtain control ratio, $\dfrac{C(s)}{R(s)}$.   **(10 Marks)**
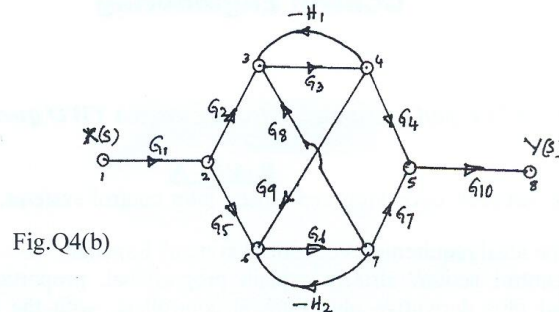
Fig.Q4(a)

b. What is MASON's gain formula? Using the same obtain the over all transfer function, $\frac{Y(s)}{X(s)}$ of the signal flow graph, given in fig. Q4(b). **(10 Marks)**

Fig.Q4(b)

PART - B

5 a. Draw the polar plot for the following system

$$GH = \frac{20(s+5)}{(s+1)(s+2)(s+8)}.$$

(06 Marks)

   b. Determine the stability of the system with

$$GH = \frac{(s+6)}{(s+2)(s-1)}, \text{ using Nyquist stability criterion.}$$

(14 Marks)

6 Construct Bode diagram for a feed back control system having its open loop transfer function.

$$GH \ \frac{100(10s+1)}{s(s+0.4)(s+1)(s+10)}. \text{ Also determine gain margin and phase margin if the system is}$$
stable.

(20 Marks)

7 The open loop transfer function of a feed back control system is given below :

$$GH = \frac{K(s+1)}{S^2(s+10)}. \text{ Construct the root locus plot and determine the range of 'K' for which the}$$
system is stable.

(20 Marks)

8 a. What is system compensation? Briefly explain the i) Series compensation   ii) Feed back compensation. **(08 Marks)**

   b. Explain the following compensating systems by locating the respective poles and zeros on complex plane and also present their effect on rough bode plots.
   i) Lag – compensation   ii) Lead – compensation. **(12 Marks)**

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Seventh Semester B.E. Degree Examination, December 2012
Computer Integrated Manufacturing

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

On the left margin (rotated text):
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Define automation. Explain different types of automation. **(10 Marks)**
   b. Explain the mathematical models, while giving mathematical equation for each teams. **(10 Marks)**

2 a. Discuss with examples types of automated flow lines. Also list the objectives of automated flow line. **(10 Marks)**
   b. Sketch and explain the working of Rollez chain drive mechanism. **(05 Marks)**
   c. List and explain control functions used in an automated flow line. **(05 Marks)**

3 a. Explain with examples upper bound and lower bound approaches to analyze automated flow line without storage buffer. **(08 Marks)**
   b. Briefly explain partial automation in a flow line. **(04 Marks)**
   c. The following data applies to a 20 station in line transfer machine. $P = 0.01$, $T_c = 0.6$min, $T_\alpha = 9$min. Using upper bound approach compute,
     i)   Ideal production rate
     ii)   Frequency of line steps
     iii)   Actual production rate
     iv)   Line efficiency. **(08 Marks)**

4 a. Explain the following terms in line balancing:
     i)   Minimum rational work element
     ii)   Precedence diagram
     iii)   Cycle time
     iv)   Balance delay. **(08 Marks)**
   b. A new product is to be assembled in a plant, the data gives the precedence relationship and element times:

Element	1	2	3	4	5	6	7	8
Time 'Te' min	1.0	0.5	0.8	0.3	1.2	0.2	0.5	1.5
Immediate predecessor	-	-	1, 2	2	3	3, 4	4	5, 6, 7

     Using largest candidate rule method,
     i)   Construct the precedence diagram for this job.
     ii)   If the ideal cycle time is to be 1.5min, what is the minimum number of work stations required?
     iii)   Calculate the balance delay. **(12 Marks)**

PART – B

5   a.   List the principles used in product design for automated assembly.   **(04 Marks)**
      b.   With neat figures explain elements of parts delivery system.   **(08 Marks)**
      c.   Define AGVS. Explain the functions and working of an AGVS.   **(08 Marks)**

6   a.   With block diagram, explain the two approaches used for designing CAPP systems.
                          (10 Marks)
      b.   What is material requirement planning? Explain the structure of a MRP system.   **(10 Marks)**

7   a.   Describe salient features of CNC systems along with a block diagram.   **(10 Marks)**
      b.   Discuss the advantages, disadvantages and applications of CNC machines.   **(10 Marks)**

8   a.   With neat figures explain the robot configurations.   **(12 Marks)**
      b.   Explain: i) Resolution; ii) Accuracy; iii) Repeatability as applied to robots.   **(08 Marks)**

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Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1　a. Explain the salient features of metal forming processes along with the advantages and limitations. **(10 Marks)**
　　b. Explain the concept of true stress and true strain. **(05 Marks)**
　　c. Write a note on determination of flow stress. **(05 Marks)**

2　a. Explain the effect on the following on metal working processes :
　　　i) Temperature　ii) Friction and Lubrication. **(10 Marks)**
　　b. Comment on i) Deformation zone geometry　　ii) Residual stresses in wrought products. **(10 Marks)**

3　a. A circular disc of diameter 120mm and height 64mm is forged between two flat dies to 36mm height. Find the die load at the end of compression using the slab method of analysis. The yield strength of the material is given by $\sigma = 15.00 \,(0.01 + \varepsilon)^{0.41}$ kg f/mm^2, and the co-efficient of friction is 0.05. Also find mean die pressure. **(08 Marks)**
　　b. Explain die design parameters in forging. **(06 Marks)**
　　c. What is the significance of slab analysis? Explain the steps involved in it. **(06 Marks)**

4　a. Define rolling. How are rolling mills classified? Briefly explain each, using schematic diagrams. **(08 Marks)**
　　b. Briefly explain the effect of front and back tension on the sheet, during rolling. **(04 Marks)**
　　c. Briefly explain the defects in rolled products and the action to be taken to prevent the defects. **(08 Marks)**

PART - B

5　a. Using a neat sketch, briefly explain the different features of a drawing die. **(06 Marks)**
　　b. Using neat sketches, explain rod drawing and wire drawing. **(06 Marks)**
　　c. Using neat sketches, explain different methods of tube drawing. **(08 Marks)**

6　a. Give the classification of extrusion processes and explain hydrostatic extrusion process, with a neat sketch. **(08 Marks)**
　　b. Explain the following : i) Defects in extrusion　　ii) Lubrication in extrusion. **(12 Marks)**

7　a. Give the classification of dies in sheet metal forming and explain "Combination Dies", with a neat sketch. **(07 Marks)**
　　b. Explain with neat sketch, the following i) Rubber forming　ii) Stretch forming. **(08 Marks)**
　　c. Write a note on forming limit criteria. **(05 Marks)**

8　a. Discuss the principle of "High Energy Rate Forming" methods and with a sketch, explain explosive forming. **(10 Marks)**
　　b. With a flow chart, explain in detail the powder metallurgy process. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, December 2012
Operation Research

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Define operation research. List the various phases of operation research. **(05 Marks)**
   b. Discuss the areas of management where operation research techniques are applied.
                                                                              (05 Marks)
   c. The manager of an oil refinery has to decide upon the optimal mix of two possible blending
      process of which the inputs and outputs per production run are as follows:

Input				Output		
Process	Crude A	Crude B		Gasoline X	Gasoline Y	
1	5	3		5	8	
2	4	5		4	4	

The maximum amounts available of crude A and B are 200 and 150 units respectively.
Market requirement show that at least 100 units of gasoline X and 80 units of gasoline Y
must be produced. The profit per production run from process 1 and process 2 are Rs.3 and
RS.4 respectively. Formulate the problem as LP model. **(10 Marks)**

2 a. Obtain the dual of the LP problem.
      Minimize $Z = x_1 + x_2 + x_3$
      Subject to $x_1 - 3x_2 + 4x_3 = 5$
      $x_1 - 2x_2 \leq 3$
      $2x_2 - x_3 \geq 4$
      $x_1, x_2 \geq 0$ and x_3 is unrestricted. **(06 Marks)**
   b. Solve the LPP by using simplex method
      Maximize $Z = 3x_1 + 5x_2 + 4x_3$
      Subject to $2x_1 + 3x_2 \leq 8$
      $2x_2 + 5x_3 \leq 10$
      $3x_1 + 2x_2 + 4x_3 \leq 15$
      and $x_1, x_2, x_3 \geq 0$. **(14 Marks)**

3 a. ABC limited has three production shops supplying a product to 5 ware hours. The cost of
      production varies from shop to shop, cost of transportation from shop to warehouse also
      varies. Each shop has a specific production capacity of each warehouse has certain amount
      of requirement. The cost of transportation are as given below:

Shop	Warehouse					Capacity	Cost for production
	I	II	III	IV	V		
A	6	4	4	7	5	100	14
B	5	6	7	4	8	125	16
C	3	4	6	3	4	175	15
Requirement	60	80	85	105	70		

Find the optimum quantity to be supplied from each shop to different warehouses at
minimum total cost. **(12 Marks)**

b. A truck company on a particular day has 5 truck for sending material to 6 terminals. The cost of sending material from same destination to different trucks will be different as given by the cost matrix below. Find the assignment of 4 trucks to 4 terminals out of 6 at the minimum cost. **(08 Marks)**

	Trucks				
	A	B	C	D	E
1	3	6	2	6	5
2	7	1	4	4	7
3	3	8	5	8	3
4	6	4	3	7	4
5	5	2	4	3	2
6	5	7	6	2	5

Terminals (rows 1–6)

4 a. List out the difference between transportation and assignment problem. **(05 Marks)**

b. i) Define total elapsed time and idle time on a machine.

ii) List the assumptions made while dealing with sequencing problem. **(05 Marks)**

c. We have five jobs each of which must go through to machines A, B and C in the order ABC.

Job number	Processing time in hours				
	1	2	3	4	5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

Determine a sequence for the jobs that will minimize the total elapsed time and idle time for each machine. **(10 Marks)**

PART – B

5 a. What is queue discipline and list the various queue discipline? **(05 Marks)**

b. At what average rate must a clerk at a supermarket work in order to ensure a probability of 0.9 that the customer will not have to wait longer than 12 minutes? It is assumed that there is only one counter to which customer arrive in a poisson fashion at an average rate of 15/hr. The length of service by the clerk has an exponential distribution. **(07 Marks)**

c. In a hair dress by saloon with one barber, the customer arrival follows poisson distribution at an average rate of one every 45 minutes. The service time is exponentially distributed with a mean of 30 minutes. Find:

i) Average number of customers in a saloon.

ii) Average waiting time of a customer before service.

iii) Average idle time of barber. **(08 Marks)**

6 a. Define:

i) Critical activity and critical path.

ii) Total float.

iii) Free float. **(06 Marks)**

b. An R and D activity has 7 activities for which the three time estimates are given below along with its preceding activity.

Activity	Preceding activity	Optimistic time (a)	Most likely time (m)	Pessimistic time (b)
A	-	4	6	8
B	A	6	10	12
C	A	8	18	24
D	B	9	9	9
E	C	10	14	18
F	A	5	5	5
G	D, E, F	8	10	12

   i)   Draw PERT network.
   ii) Find EST, LST and slack for each node.
   iii) Find critical path and expected project duration.   (14 Marks)

7 a. Define:
   i)   Fair game and saddle point.
   ii) Pure strategy.
   iii) Mixed strategy.   (06 Marks)

   b. Following is the pay-off matrix for player A

Player B

$$\text{Player A} \begin{bmatrix} 2 & 4 & 3 & 8 & 4 \\ 5 & 6 & 3 & 7 & 8 \\ 6 & 7 & 9 & 8 & 7 \\ 4 & 2 & 8 & 4 & 3 \end{bmatrix}$$

   Using dominance properties, obtain the optimum strategies for both the player and determine the value of the game.   (06 Marks)

   c. Solve the following game graphically with pay off matrix of A given in the table: (08 Marks)

Player B

	B_1	B_2
A_1	-2	0
A_2	3	-1
A_3	-3	2
A_4	5	-4

Player A

8 a. Explain zero-one integer programming.   (05 Marks)
   b. Solve the following linear programming by Gomory technique:
   Maximize $Z = x_1 + x_2$
   Subject to $2x_1 + x_2 \le 6$
               $4x_1 + 5x_2 \le 20$
               $x_1, x_2 \ge 0$ and integers.   (15 Marks)

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Seventh Semester B.E. Degree Examination, January 2013
Theory of Plasticity

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1. a. Derive the equilibrium equations in two dimensions considering body forces. **(05 Marks)**
    b. The stress components at a point are, $\sigma_x = 10\,\text{MPa}$, $\sigma_y = 25\,\text{MPa}$, $\sigma_z = 30\,\text{MPa}$, $\tau_{xy} = 15\,\text{MPa}$, $\tau_{yz} = 15\,\text{MPa}$, $\tau_{zx} = 20\,\text{MPa}$. Determine the principal stresses, octahedral stresses and representative stress. **(10 Marks)**
    c. Briefly explain generalized Hooke's law. **(05 Marks)**

2. a. Explain the mechanism of plastic deformation in the metals using twinning phenomenon. **(05 Marks)**
    b. Write a short note on the followings:
       i) Recovery, recrystallisation and grain growth.
       ii) Flow figures or Luder lines. **(10 Marks)**
    c. Briefly discuss the various factors affecting plastic deformation. **(05 Marks)**

3. a. Define the terms:
       i) Cubic dilation   ii) Octahedral strains **(05 Marks)**
    b. The strain tensor at a point is given by,
    $$\in_{ij} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 2 & 4 \\ 3 & 4 & 3 \end{bmatrix} \times 10^{-3}$$
    Calculate the deviatoric and spherical strain tensors. Also determine representative strain. **(10 Marks)**
    c. What do you mean by logarithmic natural strains and discuss its any two advantages over engineering strains. **(05 Marks)**

4. a. Enumerate the various types of materials encountered in practice from plastic flow point of view. Also sketch the corresponding models. **(12 Marks)**
    b. Explain the Saint-Venant's theory of plastic flow in detail and state its limitation. **(08 Marks)**

PART – B

5. a. What do you understand by the yield criteria? Explain the verification of yield criteria using the Taylor and Quinney's experiment. **(12 Marks)**
    b. A thin walled tube of mean radius 10 cm and wall thickness 4 mm is subjected to a torque of 10 N-m. If the yield strength of the tube material is 125 MPa, determine the value of axial load 'P' applied to the tube so that tube starts yielding according to VmMises yield criteria. **(08 Marks)**

6. a. Derive Geiringer continuity equations and state the purpose of the same. **(12 Marks)**
    b. Explain any eight properties of the slip lines. **(08 Marks)**

7   a. What are the assumptions made in the analysis of plastic bending of beams, and derive the expression for bending moment of rectangular beam under incipient yielding, elasto-plastic and fully plastic yielding in idealized stress-strain state. **(12 Marks)**

    b. A simply supported beam of width 50 mm, deep 65 mm and length 3 m carries a concentrated load of 3200 N at a distance of 2000 mm from left end support. The stress-strain curve for a beam material is given by $\sigma = 6820\,\epsilon^{0.25}$, determine the maximum stress induced in the beam and its radius of curvature. **(08 Marks)**

8   a. Obtain the expressions for residual shear stresses of Blastic-perfectly plastic materials under Elasto-plastic recovery and fully plastic recovery. **(12 Marks)**

    b. A circular shaft of inner radius 40 mm and outer radius 100 mm is subjected to a twisting couple so that the outer 20 mm deep shell yields plastically. Determine the twisting couple applied to the shaft. Shear stress in yield for the shaft material is 145 MPa. Also determine the twisting couple for full yielding. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, January 2013
Total Quality Management

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. List the six basic concepts, which are the requirements of total quality management.
                                                                              (06 Marks)
   b. List the nine dimensions of quality.   (05 Marks)
   c. Which are the obstacles to implement TQM in an organization? Briefly explain.   (09 Marks)

2 a. Briefly discuss any five points of the Deming philosophy.   (05 Marks)
   b. What is PDSA cycle? Briefly explain.   (05 Marks)
   c. With reference to Juran Trilogy, briefly explain the improvement part. (05 Marks)
   d. What is Taguchi's loss function? Briefly explain with an example.   (05 Marks)

3 a. Briefly discuss the characteristics of quality leaders.   (08 Marks)
   b. What is a quality policy statement? Briefly explain.   (04 Marks)
   c. With examples, elaborate the significance of, i) Vision statement   ii) Mission statement.
                                                                              (08 Marks)

4 a. Write short notes on:
       i) W-V model of continuous improvement.
       ii) Seven-steps of reactive improvement.   (10 Marks)
   b. How do you apply proactive improvement to develop new products? Briefly discuss.
                                                                              (10 Marks)

PART – B

5 a. What is bench marking? Mention the 6 steps that contain the core-techniques of bench marking.
                                                                              (06 Marks)
   b. Write short notes on: i) Kaizen   ii) Six-sigma.   (10 Marks)
   c. What is Re-engineering? Briefly explain.   (04 Marks)

6 a. Briefly discuss the significance of quality function deployment.   (06 Marks)
   b. Discuss the rationale for implementation of quality by design. Enumerate the benefits.
                                                                              (08 Marks)
   c. Discuss the 4 stages of FMEA (Failure mode effect analysis).   (06 Marks)

7 a. What are the benefits of ISO registration?   (05 Marks)
   b. Write short note on (any two): i) ISO9000 series of standards   ii) ISO-14000
                                      iii) TS-16959.   (10 Marks)
   c. Briefly discuss the requirements of ISO-9001.   (05 Marks)

8   With reference to product acceptance control discuss:
   a. Stages of AQL sampling.
   b. Critical defect.
   c. Attribute sampling-requirements
   d. IS-2500 (part I)/ISO 2859 – sampling procedures for inspection by attributes packages.
                                                                              (20 Marks)

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Seventh Semester B.E. Degree Examination, January 2013
Internal Combustion Engines

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. Mention the simplified assumptions used on fuel – air cycle analysis. With the help of P – V diagram, explain how the variation in specific heats and dissociation of gases tend to deviate from the ideal processes. **(10 Marks)**
   b. Explain how i) time losses and ii) incomplete combustion losses are accounted for in the real – cycle analysis. **(04 Marks)**
   c. Determine the effect of percentage change in the efficiency of otto cycle having a compression ratio of 8. If the specific heat at constant volume increases by 1.1 percent. **(06 Marks)**

2 a. Explain with the help of a P – θ (pressure – crack angle) diagram, the combustion phenomenon in SI engines. **(08 Marks)**
   b. What are the different air fuel mixture requirements to operate SI engine at different load conditions? **(06 Marks)**
   c. Explain the various factors that influence the flame speed. **(06 Marks)**

3 a. Explain the effect of following engine variables on the delay period :
      i) compression ratio ii) Quality of the fuel iii) Injection pressure iv) Engine speed v) Intake temperature. **(10 Marks)**
   b. Explain the phenomenon of knock – in C.I engine and compare it with SI engine knock. **(06 Marks)**
   c. What is delay period? Name and explain two parts of delay period. **(04 Marks)**

4 a. Explain the basic requirements of a good SI engine combustion chamber. With a neat sketch, explain I – head combustion chamber. **(10 Marks)**
   b. With a neat sketch, briefly explain with advantages and disadvantages : i) Divided combustion chamber ii) M – Type combustion chamber. **(10 Marks)**

PART - B

5 a. Discuss the important quality of an SI and CI engine fuels. **(08 Marks)**
   b. Explain the reasons for looking for alternate fuels for IC engines. **(06 Marks)**
   c. How SI and CI engine fuels are rated? **(06 Marks)**

6 a. Discuss the important requirements of an ideal diesel injection system. **(08 Marks)**
   b. Explain with reasons the necessity for gasoline injection. **(04 Marks)**
   c. What is the necessity of cooling? Explain the thermosyphon cooling system. **(08 Marks)**

7 a. What is super charging? What is its effect on the following parameters : i) Power output ii) Mechanical efficiency iii) Fuel consumption? **(08 Marks)**
   b. What are the requirements of a multi fuel engine? **(04 Marks)**
   c. Briefly explain the working of wanked rotary combustion engine. **(08 Marks)**

8 Write short notes on the following :
   a. Sources of pollutants from IC engines.   b. Effects of engine pollutions on human health.
   c. Thermal reactor package.   d. SI engine emission control. **(20 Marks)**

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