Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Economy

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Briefly explain problem solving process in decision making, with a neat sketch. **(08 Marks)**
 b. Briefly explain the law of demand and law of supply. **(06 Marks)**
 c. Determine the effective interest rate in the following cases:
   (i) Nominal rate of 12% compounded monthly with time interval of one year.
   (ii) Nominal rate of 18% compounded weekly with time interval of one year.
   (iii) Nominal rate of 13% compounded monthly with time interval of two years. **(06 Marks)**

2 a. State the conditions for present worth comparisons. **(06 Marks)**
 b. Two motorcycles of brand A and B are available on the following terms:
   (i) Motor cycle A – Make a down payment of Rs.5000 and then Rs.6000 at the end of each year for 7 years.
   (ii) Motor cycle B – Make a down payment of Rs.15,000 and no payment for the next 3 years. From the end of the 4th year annual payments of Rs.12000 for the next 4 years. **(08 Marks)**
 c. Explain (i) Common multiple (ii) Steady period method of comparing the assets that have unequal lives. **(06 Marks)**

3 a. Two types of power converter Alpha and Beta are under consideration for a particular application. An economic comparison is to made at an interest rate of 12%. Following cost estimation has been obtained. Determine the annual equivalent costs of the two systems, select the best converter. **(10 Marks)**

Cost particulars	Alpha	Beta
Purchase price	Rs.15000	Rs.25000
Estimated service life	6 years	9 years
Salvage value	Rs. 4000	Rs. 7000
Annual operating cost	Rs. 3000	Rs. 2000

 b. A sheltered workshop requires a lift truck to handle pallets for new contract. A lift truck can be purchased for Rs.270000. Annual insurance costs are 3% of the purchase price payable on the first of each year. An equivalent truck can be rented Rs.15000 per month payable at the end of each month. Operating costs are same for both alternatives. For what minimum number of months must a purchased truck be used on the contract to make purchasing more attractive than leasing? Interest is 12% compounded monthly. Assume that the purchased truck has no salvage value. **(10 Marks)**

4 a. Define (i) MARR   (ii) IRR   (iii) ERR. **(06 Marks)**
 b. Define depreciation. List and explain any two causes. **(06 Marks)**
 c. A CNC machine costs Rs.3000000 is estimated to serve 8 years after which its salvage value is estimated to be Rs.250000. Find (i) Depreciation fund at the end of the 5th year by fixed percentage method and declining balance method. (ii) Book value of the machine after 4th year and 6th year by declining balance method. **(08 Marks)**

PART – B

5 a. Briefly explain the contents of elements of cost. **(08 Marks)**

b. Differentiate between estimation and costing. **(04 Marks)**

c. A firm is producing 100 units per day. The direct material cost is found to be Rs.160, the direct labour cost is Rs.200 and factory overheads chargeable to it are Rs.250. If the selling expenses are 40% of the factory cost what must be the selling price of each unit to realize a profit of 15% of the selling price? **(08 Marks)**

6 a. The company X having certain reserves and surplus has the following details as on 31st Dec.2000.

Dividend payable	72000	Debtors	160000
Bank balance	10000	Bills payable	20000
Equity shares	200000	Plant and equipment	80000
Provision for taxes	40000	Bills receivable	20000
Stock	77000	Creditors	55000
8% preference shares	135000	General reserve	40000
Land and Building	200000	Cash in hand	15000

Prepare a balance sheet as on 31st December 2000. **(12 Marks)**

b. Differentiate between profit and loss account and balance sheet. **(08 Marks)**

7 a. List and explain various financial ratios. **(12 Marks)**

b. What are the advantages and disadvantages of financial ratio analysis? **(08 Marks)**

8 a. What are the objectives of profit planning? **(08 Marks)**

b. How do you classify budgets? Explain the production budget and sales budget. **(12 Marks)**

* * * * *

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
## Mechanical Vibrations

Time: 3 hrs.   Max. Marks:100

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

PART - A

**1** a. Define Vibrations. Explain any four type of vibrations.   **(06 Marks)**
   b. Write a short note on Beats.   **(04 Marks)**
   c. Add the following motions analytically and check the solution graphically :
     $x_1 = 4 \cos (wt + 10^0)$; $x_2 = 6 \sin (wt + 60^0)$.   **(10 Marks)**

2 a. Determine the natural frequency of the system shown in fig. Q2(a).   **(10 Marks)**

Fig. Q2(a)
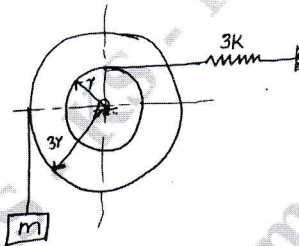
   b. Determine the natural frequency of the system shown in fig. Q2(b).   **(10 Marks)**


Fig. Q2(b)
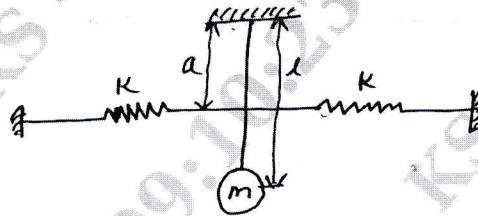
3 a. Find the equation of motion for the system of spring mass and damper system when
     i) $\xi = 1$ ii) $\xi = 0.3$ iii) $\xi = 2$.
     If the mass 'm' is displaced by a distance of 3 cm and released.   **(10 Marks)**
   b. A vibrating system is having mass 3 kg and spring stiffness 100 N/m, damping co-efficient is 3N-S/m. Determine damping ratio, damped natural frequency, logarithmic decrement , ratio of law consecutive amplitudes and number of cycles when the original amplitude is reduced to 20%.   **(10 Marks)**

4 a. What is Magnification Factor? Derive an expression for the same and discuss its variation with frequency ratio.   **(10 Marks)**
   b. A machine of total mass 68kg mounted on spring of stiffness K = 11000 N/cm. With an assumed dumping factor $\varsigma = 0.2$. A piston within the machine has a mass of 2kg has a reciprocating motion with stroke 7.5cm and a speed of 3000 rpm. Assuming the motion of piston to be S.H.M. Determine   i) Amplitude of Machine
     ii) Phase angle with respect to exciting force.
     iii) Transmissibility and force transmitted to foundation.
     iv) Phase angle of transmitted force with respect to exciting force.   **(10 Marks)**

## PART - B

5 a. With a neat schematic diagram, explain seismic instrument as :
       i) a vibrometer   ii) an accelerometer.   **(10 Marks)**

   b. A rotor of mass 12kg is mounted midway on a 25mm diameter horizontal shaft supported at
       the ends of two bearings. The span between the bearings is 900mm. Because of same
       manufacturing defects the C.G (Centre of gravity) of the rotor is 0.02mm away from
       geometric centre of rotor. If the system rotates at 3000 rpm, determine the amplitude of
       steady state vibrations and the dynamic force on the bearings. Take E = 200 GPa. **(10 Marks)**

6 a. A two degrees of freedom vibrating system is shown in fig. Q6(a). Determine i) The two
       natural frequencies of vibrations   ii)   Ratio of amplitudes of motion of m_1 & m_2 for the
       two modes of vibration   iii) Model vector and Model shapes.
       Given $m_1 = 2kg$, $m_2 = 1 kg$, $k_1 = 40$ N/m and $k_2 = 20$N/m.   **(15 Marks)**

Fig. Q6(a)
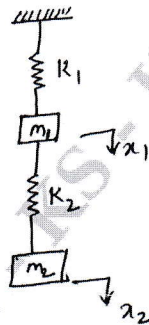
   b. Explain Dynamic Vibration Absorber with a sketch of a spring mounted dynamic absorber?
                                                                                  (05 Marks)

7 a. Find the lowest natural frequency of transverse vibrations of the system shown in fig.Q7(a),
       by Rayleigh's method E = 196 GPa , I = 10^{-6} m^4 , $m_1 = 40$ kg , $m_2 = 20$kg.   **(10 Marks)**

Fig. Q7(a)
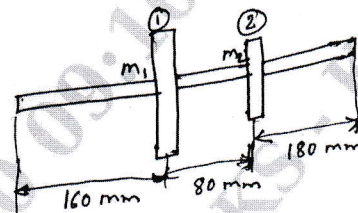
   b. For the system shown in fig.Q7(b), find the lowest natural frequency by Stodola's method.
                                                                                  (10 Marks)

Fig. Q7(b)
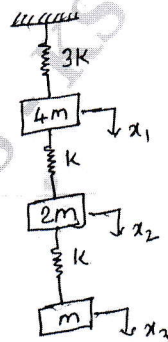
8 a. Explain Dynamic testing of Machines.   **(06 Marks)**
   b. Explain the experimental modal analysis.   **(06 Marks)**
   c. Explain machine condition monitoring techniques.   **(08 Marks)**

*****

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Hydraulics & Pneumatics

Time: 3 hrs.   Max. Marks:100

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

PART – A

1. a. State Pascal's law. Mention its significance. **(04 Marks)**
   b. List the advantages and limitations of hydraulic system. **(05 Marks)**
   c. What is meant by positive displacement pump? With a neat sketch explain the construction and working of gear within gear pump. **(11 Marks)**

2. a. Explain in brief the telescopic cylinder with a neat sketch. **(04 Marks)**
   b. Discuss various types of mountings on cylinders with appropriate sketches. **(10 Marks)**
   c. A hydraulic motor has a volumetric displacement of $125 \times 10^{-6} \, m^3$ and a pressure rating of 150 bar. It receives a theoretical flow rate of oil $0.0015 \, m^3/s$ from a pump. Find (i) The motor speed (ii) Theoritical torque (iii) Theoritical power. **(06 Marks)**

3. a. Explain briefly the rotary type directional control valve with a neat sketch. **(06 Marks)**
   b. Explain the following with neat sketches:
      (i) Pressure reducing valve.
      (ii) Pressure compensated flow control valve.
      Also mention their symbolic representations. **(14 Marks)**

4. a. With a neat circuit, explain as to how force multiplication is achieved in hydraulic industrial. **(06 Marks)**
   b. Briefly explain the factors affecting synchronization of actuators in hydraulic circuits. **(02 Marks)**
   c. Explain the following with neat circuits:
      (i) Synchronization of actuators using flow control valves.
      (ii) Sequencing circuit. **(12 Marks)**

PART – B

5. a. Explain the following properties with reference to hydraulic oils:
      (i) Viscosity and Viscosity index.
      (ii) Oxidation stability.
      (iii) Demulsibility.
      (iv) Lubricity. **(08 Marks)**
   b. Differentiate between:
      (i) Internal leakage and external leakage.
      (ii) 'O' rings and 'U' ring seals. **(04 Marks)**
   c. Explain the following :
      (i) Pressure line and Return line filter.
      (ii) Proportional filter. **(08 Marks)**

6 a. Explain briefly the pneumatic system with the help of a block diagram.   **(06 Marks)**
   b. Explain the various characteristics of compressed air.   **(06 Marks)**
   c. Write a note on:
       (i)   FRL unit.
       (ii) Rodless cylinders.   **(08 Marks)**

7 Explain the following:
   a. Quick Exhaust valves.
   b. Twin Pressure valves.
   c. Time dependent valves.
   d. OR and AND gates in pneumatic applications.   **(20 Marks)**

8 a. Explain briefly the motion diagram and control diagram.   **(08 Marks)**
   b. Write a note on relay switches.   **(05 Marks)**
   c. Explain the working of a lubricator with a neat sketch in a pneumatic system.   **(07 Marks)**

* * * * *

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
at least TWO full questions from each part.
2. Use of SQC tables is permitted.
3. Missing data, if any may be suitably assumed.

PART – A

1 a. Define OR and mention the assumptions made in Linear Programming Problem. **(05 Marks)**

   b. An industry manufactures two items. It purchases castings which are then machined, bored and polished. Castings for items A and B cost Rs.30 and Rs.40 respectively and are sold at Rs.60 and Rs.70 each respectively. Running costs of the three machines are Rs.200, Rs.140 and Rs.175 per hour respectively. Formulate the problem as LPP and solve it graphically Capacities of the machines are

	Item A	Item B
Machining	25/hr	40/hr
Boring	28/hr	35/hr
Polishing	35/hr	25/hr

(15 Marks)

2 a. Explain:
   i)   Leaving variable and entering variable
   ii) Non degenerate basic feasible solution
   iii) Features of duality. **(06 Marks)**

   b. Solve by simplex method,
   Minimize $Z = 2x_1 + 3x_2$
   Subject to $x_1 + x_2 \geq 5$
   $x_1 + 2x_2 \geq 6$ and
   $x_1, x_2 \geq 0$ **(14 Marks)**

3 a. Find the optimal solution to the following transportation problem which minimizes the unit transportation cost (in Rs.): **(08 Marks)**

		Destination				
		1	2	3	4	Availability
	1	8	10	7	6	50
Source	2	12	9	4	7	40
	3	9	11	10	8	30
Demand		25	32	40	23	

   b. A department has four subordinates and four tasks to be performed. The subordinates differ in efficiency and tasks differ in their intrinsic difficulty. The estimates of the profit in rupees each man would earn is given in the following matrix. Find the optimal allocation which maximizes the total earnings. **(06 Marks)**

		Tasks			
		1	2	3	4
	1	50	400	200	50
Subordinates	2	250	350	300	250
	3	150	250	200	100
	4	150	50	300	150

c. Products 1, 2, 3, 4 and 5 are to be processed on a machine. The setup costs in rupees per change depend upon the product presently on the machine and the set up to be made and are given by the following data:

$c_{12} = 16$, $c_{13} = 4$, $c_{14} = 12$, $c_{23} = 6$, $c_{34} = 5$, $c_{25} = 8$, $c_{35} = 6$, $c_{45} = 20$ and $c_{ij} = c_{ji}$, $c_{ij} = \infty$ for all values of i and j not given in the data. Find the optimum sequence of products in order to minimize the total setup cost. **(06 Marks)**

4   Solve by the Gomory algorithm.
Maximize $Z = 5x_1 + 7x_2$
Subject to $-2x_1 + 3x_2 \le 6$
$$6x_1 + x_2 \le 30$$
$$x_1, x_2 \ge 0 \text{ and integers}$$
(20 Marks)

PART – B

5   a. Define: i) Activity   ii) Event   iii) Path   iv) Network. **(04 Marks)**

b. Draw the network for the activities involved in the computer installation process are given below:

Activity		Predecessor Activity
A.	Physical preparation	-
B.	Planning	-
C.	Personnel selection	B
D.	Equipment installation	A
E.	Personnel training	C
F.	Detailed system design	C
G.	File conversion	F
H.	Establish standards and controls	F
I.	Program preparation	H
J.	Program testing	I
K.	Parallel operations	D, E, G, J
L.	Systems documentation	I
M.	Follow up	K, L

(04 Marks)

c. The project consists of the following activities. Determine:
i)   Draw the network
ii) Critical path
iii) Earliest and latest times and
iv) Total float. **(12 Marks)**

Activity ij	Duration $t_E{}^{ij}$
0-1	1
1-2	4
1-3	5
2-4	3
2-5	1.5
3-4	1.5
3-6	3.5
4-7	2.5
5-6	1
6-7	4

6 a. With usual notations derive an expression for expected number of units in the system.
(10 Marks)

b. On an average 96 patients per 24 hour day require the service of an emergency clinic. Also on average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. The clinic costs Rs.100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs.10 per patient. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1\frac{1}{3}$ patients to 1/2 patient?
(10 Marks)

7 a. Find the value of the game shown below and determine the optimum strategies. Is the game strictly determinable?
(04 Marks)

Player B

Player A

6	-2	-3	8
-1	-2	-7	0
8	9	-6	-7
9	5	-7	7

b. In a game of matching coins with two players, suppose A wins one unit of value when there are two heads, wins nothing when there are two tails, and loses 1/2 unit of value when there are one head and one tail. Determine the pay off matrix, strategies for each player and value of the game.
(04 Marks)

c. Solve the following game graphically

Player A

	Player B	
	B_1	B_2
A_1	-4	3
A_2	-7	1
A_3	-2	-4
A_4	-5	-2
A_5	-1	-6

(12 Marks)

8 a. List the various assumptions made in solving sequencing problems.
(04 Marks)

b. A book binder has one printing press, one binding machine and manuscript of a number of different books. The times required in minutes to perform the printing and binding operations for each book are known. Determine the order in which books should be processed in order to minimize the total time required to turn out all the books.

Book	1	2	3	4	5	6
Printing time	30	120	50	20	90	110
Binding time	80	100	90	60	30	10

(08 Marks)

c. There are two jobs to be processed through five machines A, B, C, D and E. The order of processing and processing time in hours is given below:

Job 1 :	A	B	C	D	E
Time :	3	4	2	6	2
Job 2 :	B	C	A	D	E
Time :	5	4	3	2	6

Determine the optimal sequencing of jobs and the minimum total elapsed time.
(08 Marks)

* * * * *

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Total Quality Management

Time: 3 hrs.   Max. Marks:100

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

PART - A

1 a. Explain six basic approaches to TQM.   (08 Marks)
   b. Define Quality. List the dimensions of quality and explain its meaning.   (06 Marks)
   c. Explain the obstacles in the implementation of TQM.   (06 Marks)

2 a. Discuss the characteristics of highly effective people.   (08 Marks)
   b. Mention the general duties of quality council.   (05 Marks)
   c. Discuss seven steps to strategic planning.   (07 Marks)

3 a. Write a note on customer perception of quality.   (05 Marks)
   b. With a neat sketch, explain the Kano model of translating needs into requirements.
                                                                                                       (10 Marks)
   c. Explain Maslow's Hierarchy of needs.   (05 Marks)

4 a. With a neat sketch, explain PDSA cycle.   (06 Marks)
   b. Write a note on Kaizen and mention the benefits of FMEA.   (09 Marks)
   c. Explain Total Productive maintenance.   (05 Marks)

PART - B

5 a. List any 7 Quality Management Tools and explain Process Decision Program Chart (PDPC).   (08 Marks)
   b. Discuss Nominal Group Technique and mention its advantages and disadvantages. (08 Marks)
   c. Write a note on Affinity diagram.   (04 Marks)

6 a. Explain i) Process Flow diagram   ii) Cause and effect diagram.   (08 Marks)
   b. Explain Control charts for variables and control charts for attributes.   (08 Marks)
   c. Write a note on State of Control.   (04 Marks)

7 a. Explain the steps involved in the implementation of Quality Management System.
                                                                                      (10 Marks)
   b. Explain ISO – 9000 series of standards.   (06 Marks)
   c. Write a note on six sigma.   (04 Marks)

8 a. Explain the various signal – to – noise ratios.   (08 Marks)
   b. Write short notes on :
      i) Design of Experiments.
      ii) Quality loss function.
      iii) Orthogonal arrays.
      iv) Parameter design.
                                                                                       (12 Marks)

*****

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

Tool Design

Time: 3 hrs.

Max. Marks:100

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

PART – A

1   a.   Define tooling and explain general tool design procedure.   (10 Marks)
    b.   With a neat sketch, explain nomenclature of single point cutting tool.   (10 Marks)

2   a.   With a neat sketch explain the elements of twist drill.   (10 Marks)
    b.   Explain the parameters to be considered while designing milling cutter.   (10 Marks)

3   a.   Describe with neat sketch 3-2-1 principle of location.   (08 Marks)
    b.   List and explain types of drill bushes.   (08 Marks)
    c.   Write principles of clamping.   (04 Marks)

4   a.   What is the difference between a jig and a fixture?   (06 Marks)
    b.   What are the advantages of using a fixture?   (04 Marks)
    c.   Explain the requirements of tool designers to design a fixture.   (10 Marks)

PART – B

5   a.   Explain the elements of press tool with neat sketch.   (10 Marks)
    b.   List and explain any four press tool operations.   (10 Marks)

6   a.   Explain the variables that affect metal flow during drawing operation.   (10 Marks)
    b.   Explain with neat sketch V-bending and edge bending operation.   (10 Marks)

7   a.   Explain the following elements:
         i) Core   ii) Cavity   iii) Runner
         iv) Gate   v) Ejector pin   (10 Marks)
    b.   Explain the casting defects with suitable remedies.   (10 Marks)

8   a.   List the advantages and limitations of moulding process.   (06 Marks)
    b.   List the applications of moulding process.   (04 Marks)
    c.   Explain with neat sketch parts of injection mould.   (10 Marks)

* * * * *