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10ME71

Seventh Semester B.E. Degree Examination, June/July 2016
Engineering Economy

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting
at least TWO questions from each part.
2. Use of discrete interest factor table is permitted.

PART – A

1 a. Differentiate between: i) Intuition and analysis, ii) Tactics and strategy. **(08 Marks)**
  b. Briefly explain the law of demand and supply. **(06 Marks)**
  c. A loan of ₹10000 borrowed today under an agreement that ₹14000 is to be paid sometime in future. When should the payment be made, if the loan earns interest at a rate of 8% compounded quarterly (interpolate if necessary). **(06 Marks)**

2 a. Explain the future worth method of comparison. **(05 Marks)**
  b. Two types of trucks are available for transportation use. The details are as follows:

Particulars	Truck A	Truck B
First cost (₹)	10,00,000	15,00,000
Maintenance cost (₹) (Annual)	20,000	15,000
Estimated Salvage value (₹)	2,00,000	5,00,000
Estimated life	5 years	10 years

  Both the truck deliver same amount of work. Assume interest rate of 7%. Which truck is to be preferred on PW case. **(10 Marks)**
  c. A NGO received funds of ₹10,00,000 from the government for the construction and up keep of the administration building for 10 years. Annual maintenance and salary of the staff estimated to be ₹20000 for the first year and likely to increase 10% every year upto 10 years. In addition ₹25000 needed for painting every 5 years. The NGO has to make own arrangement to earn revenue for perpetual maintenance after 10 years. What amount remains with NGO for the construction of building if 10% interest considered? **(05 Marks)**

3 a. Write notes on: i) Ownership life, ii) Accounting life, iii) Economic life. **(06 Marks)**
  b. The first cost of an asset is ₹5,00,000. The annual maintenance in the first year is ₹2000 and increases by ₹1000 every year upto 10th year. The annual income is expected to be ₹50000 in the first year with increase of ₹25000 every year upto 10th year. The operating cost is ₹6000 per year. The salvage value is ₹30000 at the end of 10th year. Find the equivalent annual cost of the machine at 12% interest rate. **(08 Marks)**
  c. An asset was purchased five years ago for ₹52000. It was expected to have an economic life of 8 years at which salvage value would be ₹4000. If the function of the asset would no longer needed for what price must it be sold now to recover the invested capital when i = 12%. **(06 Marks)**

4 a. Explain: (i) MARR, (ii) IRR, (iii) Depreciation. **(06 Marks)**
  b. Explain briefly the causes of depreciation. **(06 Marks)**
  c. A CNC machine costs ₹30,00,000 is estimated to serve for 8 years after which its salvage value is estimated to be 2,50,000. Find:
    i) Book value of machine after 4th and 6th year by declining balance method.
    ii) Depreciation fund during 6th and 7th year by SOYD method.
    iii) Depreciation charge by straight line method of depreciation. **(08 Marks)**

PART – B

5 a. Differentiate between estimating and costing. **(06 Marks)**

  b. Two operators involved in forging machine for 96 jobs. Each weighing 5 kg in a shift of 8 hours. They are paid at the rate of ₹500 and ₹400 per day. The forged material costs ₹40 per kg. If the factory and administrative costs put together twice of the labour cost. Find the cost of production per unit. **(07 Marks)**

  c. A company produces components for tractors. The selling expenses are ¼ th of the factory cost. If the material cost, labour cost and factory overhead charges in the ratio 1:4:2, if the material cost is ₹3000, what profit is made, if the management wants to make a profit of 10% on total cost? Determine the selling price. **(07 Marks)**

6 a. Write a note on current assets and liabilities. **(04 Marks)**

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

  c. Following is the financial status of a company as on 31st March 2015. Prepare a balance sheet.

Particulars	Amount in (₹)	Particulars	Amount in (₹)
Share capital	2,00,000	Cash at bank	2,500
Sundry creditors	39,500	Sundry debtors	87,490
Bills payable	33,780	Land & Building	1,48,500
Bank overdraft	59,510	Goodwill	000
Reserves	50,000	Plant & Machinery	1,12,950
From profit and loss a/c	39,690	Provision for Tax	40,000
Stock	1,11,040		

(08 Marks)

7 a. Briefly explain: i) Liquidity ratios, ii) Activity ratios. **(10 Marks)**

  b. Assume that a firm has owners equity of ₹1,00,000. The ratios of firm are:
  Current debt to total debt = 0.40
  Total debt to owners equity = 0.60
  Fixed assets to owners equity = 0.60
  Total assets turnover = 2 times
  Inventory turnover = 8 times
  From the given data calculate total debt, inventory, fixed assets, total capital, total assets and sales. **(10 Marks)**

8 a. What is financial planning? List and explain essentials of financial planning. **(08 Marks)**

  b. Explain briefly the advantages and limitations of budgeting. **(06 Marks)**

  c. Write notes on:
  i) Production budget and manufacturing budget
  ii) Capital expenditure budget **(06 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2016
Mechanical Vibration

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   Define the following terms :
     (i) Periodic motion   (ii) Degree of freedom   (iii) Resonance (iv) Phase difference.
                                                  (04 Marks)

   b.   Add the following motion analytically and check the solutions graphically.
     $x_1 = 3\sin(8t + 30°)$, $x_2 = 2\cos(8t - 15°)$ **(08 Marks)**

   c.   Represent the periodic motions given by following Fig Q1(c) by harmonic series.

Fig. Q1(c)
                                                  (08 Marks)

2   a.   Find out the natural frequency of the system shown in Fig. Q2 (a) by using (i) Newton's method (ii) Energy method.   **(10 Marks)**

Fig. Q2(a)

   b.   Determine the natural frequency of spring mass system taking the mass of the spring into account.   **(10 Marks)**

3   a.   Set up differential equation for a spring mass damper system and obtain the complete solution for the under damped condition.   **(08 Marks)**

   b.   Derive the equation of motion for the system shown in Fig. Q3(b). If m = 1.5kg, K = 4900N/m, a = 6cm, b = 14cm, determine the value of "C" for which the system is critically damped.   **(06 Marks)**


Fig. Q3(b)
Rod is stiff and of
negligible mass

c. In a spring mass system, the mass of 10kg makes 40 oscillations in 20 seconds without damper. With damper, the amplitude decreases to 0.20 of the original value after 5 oscillations. Find out (i) stiffness of the spring (ii) Logarithmic decrement (iii) Damping factor (iv) Actual damping coefficient. **(06 Marks)**

4 a. Define the term "Transmissibility", and derive the expression for transmissibility ratio due to harmonic excitation. **(08 Marks)**

b. A machine mass on ton is acted upon by an external force 2450N at a frequency of 1500rpm. To reduce the effects of vibration, isolator of rubber having a static deflection of 2mm under the machine load and an estimated damping factor of 0.2 are used. Determine:
   i) Force transmitted to the foundation
   ii) Amplitude of vibration of the machine
   iii) Phase lag of the transmitted force with respect to the external force. **(12 Marks)**

PART – B

5 a. Discuss the principle of operation of a vibrometer and an accelerometer. Draw the relevant frequency response curve **(10 Marks)**

b. A shaft 1.5m long is supported in flexible bearing at the ends carries a wheel of 50kg mass at a distance 0.375m from the left hand side bearing. The shaft is hollow of external diameter 75mm and internal diameter 40mm. the density of the shaft material is 7.7 Mg/m^3 and its modulus of elasticity is 200GN/m^2. Find the whirling speed of shaft, taking into account the mass of the shaft. **(10 Marks)**

6 a. What is dynamic vibration absorber? Explain briefly the dynamic vibration absorber with diagram and equations. **(10 Marks)**

b. Find the natural frequencies of the system shown in Fig. Q6(b). Also draw the mode shapes and locate the node. **(10 Marks)**
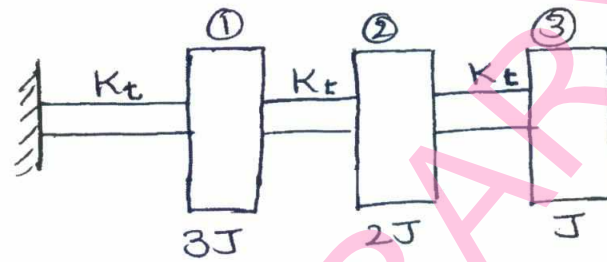

Fig. Q6(b)
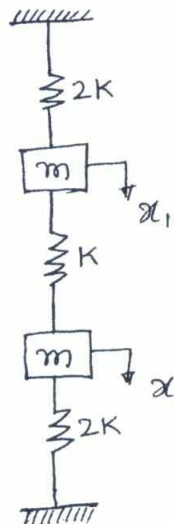
7 a. Determine the natural frequency of the system shown in Fig. Q7(a), by using Holzer's method. Assume $K = 1N/m$, $m = 1kg$. **(10 Marks)**
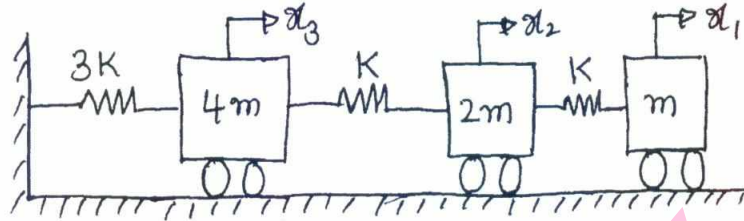
b. Determine the first natural frequency of the system shown in Fig. Q7 (b), by using matrix iteration method. **(10 Marks)**

8   Write a short notes on any FOUR
  a. Dynamic testing of machines
  b. Machine condition monitoring
  c. Orthogonality of principal modes
  d. Machine vibration monitoring
  e. Experimental modal analysis. **(20 Marks)**

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10ME73

Seventh Semester B.E. Degree Examination, June/July 2016
Hydraulics and Pneumatics

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Sketch and explain structure of a hydraulic control system. **(06 Marks)**
   b. Explain the construction and working of a external gear pump. **(07 Marks)**
   c. Determine the volumetric efficiency of a gear pump of external diameter and internal diameter of gears 75 mm and 50 mm respectively and width of gear teeth 50 mm, if the actual discharge is 30 LPM at 1800 rpm [LPM = Liters per min]. **(07 Marks)**

2 a. Sketch and explain the working of a swash plate type piston motor. **(06 Marks)**
   b. Sketch and explain double acting cylinder. **(06 Marks)**
   c. A hydraulic motor has a volumetric displacement of 123 cm^3. If it receives 0.0009 m^3/sec of oil at 50 bars.
   Find (i) Speed of the motor (ii) Theoritical torque (iii) Theoretical power of the motor. **(08 Marks)**

3 a. Briefly classify valves based on the type of function performed. **(04 Marks)**
   b. Sketch and explain the constructional features of poppet valve. **(08 Marks)**
   c. Sketch and explain pressure Compensated flow control valve. **(08 Marks)**

4 a. Sketch and explain the operation of a hydraulic circuit for the control of a spring return-single acting cylinder. **(06 Marks)**
   b. What is regenerative circuit? Sketch schematically regenerative circuit to increase the extension speed of a double acting cylinder. **(06 Marks)**
   c. What are hydraulic accumulators? Sketch and explain dead weight or gravity accumulator. **(08 Marks)**

PART – B

5 a. What are the desirable properties of hydraulic oil? Explain them. **(08 Marks)**
   b. What are the main functions and secondary functions of a reservoir? Classify them. **(06 Marks)**
   c. Sketch and explain full flow filter. **(06 Marks)**

6 a. What are the characteristics of compressed air? Explain them. **(06 Marks)**
   b. Sketch and explain structure of pneumatic control system. **(08 Marks)**
   c. Sketch and explain rodless cylinder. **(06 Marks)**

7 a. What are flow control valves? Draw graphical symbols for F.C.V. **(04 Marks)**
   b. Sketch and explain construction and principle of operation of a quick exhaust valve. **(08 Marks)**
   c. Sketch and explain pressure dependent control circuit. **(08 Marks)**

8 a. Explain the principle of cascade control system. **(06 Marks)**
   b. List advantages of solenoid controlled pilot operated directional control valve. **(04 Marks)**
   c. List different types of compressor. Explain with a neat sketch production of compressed air. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2016
Operations Research

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. A cargo plane has 3 compartments for storing cargo: front, centre and rear. These compartments have the following limits on both weight and space.

Compartment	Weight capacity (in Tonnes)	Space capacity (in cubic meters)
Front	10	6800
Centre	16	8700
Rear	8	5300

Furthermore, the weight of the cargo in the respective compartments must be the same proportion of that compartment's weight capacity to maintain the balance of the plane. The following four cargoes are available for shipment on the next flight:

Cargo	Weight (Tonnes)	Volume (Cubic meters)	Profit (£/Tonne)
C_1	18	480	310
C_2	15	650	380
C_3	23	580	350
C_4	12	390	285

Any proportion of these cargoes can be accepted. The objective is to determine how much of each cargo C_1, C_2, C_3 and C_4 should be accepted and how to distribute each among the compartments so that the total profit for the flight is maximized.
Formulate the above problem as a linear program.   **(10 Marks)**

b. Solve the following problem using graphical method.
Maximize $Z = 2x_1 + 3x_2$
Subject to $2x_1 + x_2 \leq 6$
            $x_1 - x_2 \geq 3$
            $x_1, x_2 \geq 0$ **(10 Marks)**

2 a. Solve the following linear programming problem using simplex method.
Maximize $Z = 6000x_1 + 4000x_2$
Subject to $4x_1 + 3x_2 \leq 360$
            $2x_1 + x_2 \leq 160$
            $2x_1 + 3x_2 \leq 300$
             $x_1, x_2 \geq 0$ **(12 Marks)**

b. Solve by dual simplex method the following problem.
Minimize $Z = 2x_1 + 2x_2 + 4x_3$
Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$
            $3x_1 + x_2 + 7x_3 \leq 3$
            $x_1 + 4x_2 + 6x_3 \leq 5$
            $x_1, x_2, x_3 \geq 0$ **(08 Marks)**

3 a. A product is produced by four factories A, B, C & D. The unit production counts in them are A – 50 units;   B – 70 units;   C – 30 units   and   D – 50 units. These factories supply the product to four stores, demands of which are 25, 35, 105 and 20 units respectively. Unit transport cost in Rupees from each factory to each store is given below.

	1	2	3	4
A	2	4	6	11
B	10	8	7	5
C	13	3	9	12
D	4	6	8	3

Determine the extent of deliveries from each factory to each of the stores so that the total production and transportation cost is minimum.   **(12 Marks)**

b. Four new machines M_1, M_2, M_3 & M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D & E. Because of limited place, machine M_2 cannot be placed at C and M_3 cannot be placed at A. C_{ij} , the assignment cost of machine i to place j in dollars is shown below.

	A	B	C	D	E
M_1	4	6	10	5	6
M_2	7	4	-	5	4
M_3	-	6	9	6	2
M_4	9	3	7	2	3

Find the optimum assignment schedule.   **(08 Marks)**

4 Solve the following using Gomory's cutting plane algorithm.
Maximize $Z = 20000x_1 + 30000x_2$
Subject to $2x_1 + x_2 \leq 6$; $x_1 + 2x_2 \leq 8$; $x_1 - x_2 \leq 1$; $x_1 \leq 2$
$x_1 , x_2 \geq 0$ and are integers.   **(20 Marks)**

PART – B

5 a. A project schedule has the following characteristics:

Activity	Time (Weeks)	Activity	Time (Weeks)
1 – 2	4	5 – 6	4
1 – 3	1	5 – 7	8
2 – 4	1	6 – 8	1
3 – 4	1	7 – 8	2
3 – 5	6	8 – 10	5
4 – 9	5	9 – 10	7

i) Construct the network and compute E & L for each event.
ii) Find the critical path and project duration.   **(12 Marks)**

b. What are the characteristics of a project? Also define the PERT and crashing cost. **(08 Marks)**

6 a. Define five operating characteristics of a queueing system.   **(10 Marks)**

b. A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, find
i) Average no. of customers in the system.
ii) Average no. of customers in the queue.
iii) Average time a customer spends in the system.
iv) Average time a customer waits before being served.   **(10 Marks)**

7 a. Reduce the following game by dominance and find the game value. **(10 Marks)**

Player B

		1	2	3	4
	1	3	2	4	0
Player A	2	3	4	2	4
	3	4	2	4	0
	4	0	4	0	8

b. Solve the following game by the graphical method. **(10 Marks)**

Player B

		1	2	3	4
Player	1	3	3	4	0
A	2	5	4	3	7

8 a. Six jobs A, B, C, D, E & F have arrived at one time to be processed on a single machine. Assuming that no new jobs arrive thereafter, determine

Job	A	B	C	D	E	F
Processing Time (in minutes)	7	6	8	4	3	5

i)   Optimal sequence as per SPT rule
ii) Completion time of the jobs
iii) Mean flow time
iv) Avg. in process inventory. **(08 Marks)**

b. There are seven jobs, each of which has to go through the machines A & B in the order AB. Processing times in hours are given as

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time. Also find the idle time for both the machines. **(12 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2016
Product Lifecycle 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 the need and benefits of PLCM. (04 Marks)
   b. Explain the components of PLCM. (08 Marks)
   c. Explain Product Life cycle model with neat sketch. (08 Marks)

2 a. Explain the elements of PLCM. (08 Marks)
   b. Explain the six phases of product development process. (08 Marks)
   c. Explain the characteristics of PLCM. (04 Marks)

3 a. Explain the components of product data management. (08 Marks)
   b. Explain the reasons for Implementing PDM systems. (08 Marks)
   c. Explain the importance of PDM systems. (04 Marks)

4 a. Discuss about Engineering Vaulting. (04 Marks)
   b. Explain Engineering change management. (08 Marks)
   c. Explain collaborative product development. (08 Marks)

PART – B

5 a. Explain the steps involved in an acrobat 3D document. (10 Marks)
   b. Explain the process of creation of 3DXML and CAD software tools. (10 Marks)

6 a. Discuss about the best practices of knowledge and optimization of design products. (10 Marks)
   b. Explain the parameterization of product design. (10 Marks)

7 a. Explain the concept of Digital manufacturing. (10 Marks)
   b. Explain the benefits of manufacturing. (10 Marks)

8 a. Discuss the PLM initiative to support corporate objectives. (08 Marks)
   b. Explain about PLM strategy. (08 Marks)
   c. Explain about PLM assessment. (04 Marks)

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