USN | | | | | | | | | | **10ME71**

Seventh Semester B.E. Degree Examination, June/July 2018
Engineering Economy

Time: 3 hrs.   Max. Marks:100

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

PART – A

1. a. Briefly explain Intution and analysis with respect to decision making. **(06 Marks)**
   b. Explain briefly the law of supply and law of demand. **(07 Marks)**
   c. Differentiate between strategy and tactics by giving suitable example and illustration. **(07 Marks)**

2. a. Explain the conditions for present worth comparision. **(10 Marks)**
   b. An investor can make three end-of-year payments of Rs. 15,000, which are expected to generate receipts of Rs. 10,000 at the end of year 4 that will increase annually by Rs. 2500 for the following 4 years. If the investor can earn a rate of return of 10% on other 8 year investments, is this alternative attractive? **(10 Marks)**

3. a. Explain the following with respect to life of an asset by providing suitable example,
   - (i) Ownership life.
   - (ii) Accounting life
   - (iii) Economic life. **(10 Marks)**
   b. Two models of small machines perform the same function. Type 1 machine has a low initial cost of Rs.9500, relatively high operating costs of Rs.1900 per year more than those of the type 2 machine, and a short life of 4 years. The more expensive type 2 machine cost Rs.25,100 and can be kept in service economically for 8 years. The scrap value from either machine at the end of its life will barely cover its removal cost. Which is preferred when the minimum attractive rate of return is 8%? **(10 Marks)**

4. a. Define the following:
   - (i) MARR   (ii) IRR   (iii) ERR. **(06 Marks)**
   b. Define depreciation. Explain the causes of depreciation. **(06 Marks)**
   c. Computers purchased by a public utility cost Rs. 7000/- each. Past records indicate that they have useful life of 5 years, after which, they will be disposed of, with no salvage value. The company has a cost of capital of 7%. Determine the following by using straight line method:
   - (i) Depreciation charge during year 1 and 2.
   - (ii) Depreciation reserve accumulated at the end of year 3.
   - (iii) The Book value of computers at the end of year 3. **(08 Marks)**

PART – B

5. a. Explain the importance of estimating and costing. State the various components of cost that are to be considered to arrive at the selling price during the manufacture of a product. **(10 Marks)**
   b. The market price of a lathe is Rs.50,000 and the discount allowed to the distributor is 20% of the market price. It is found that the selling expense cost is $\frac{1}{4}^{th}$ of factory cost and if the material cost, labour cost and factory overhead charges are in the ratio of 1 : 4 : 2. What profit is made by factory on each lathe if material cost is Rs. 4000. Neglect other overheads. **(10 Marks)**

6 a. What do you understand by the following financial terms:
- (i) Preferential shares.
- (ii) Assets.
- (iii) Liabilities.
- (iv) Sundry debtors.
- (v) Sundry creditors. **(10 Marks)**
 b. Explain profit and loss statement and balance sheet, with suitable examples. **(10 Marks)**

7 a. Explain the different types of financial ratios. **(14 Marks)**
 b. What are the merits and demerits of financial ratios? **(06 Marks)**

8 a. List the objectives of profit planning. **(05 Marks)**
 b. What are the advantages and disadvantages of budgeting? **(06 Marks)**
 c. What are the types of budgets? Explain. **(09 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2018
Mechanical Vibrations

Time: 3 hrs.   Max. Marks:100

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

PART – A

1. a. Derive an expression for workdone by a harmonic force. **(08 Marks)**
   b. Explain beats phenomenon and discuss the importance of beats. **(04 Marks)**
   c. Determine the algebraic sum of the harmonic motions given by $x_1 = 3\sin\left(\omega t + \dfrac{\pi}{3}\right)$ and $x_2 = 5\sin\left(\omega t + \dfrac{2\pi}{3}\right)$ analytically as well as graphically. **(08 Marks)**

2. a. Figure Q2 (a) shows a cylinder of mass m and radius r rolls without slipping on a cylindrical surface of radius R. Determine using energy method, (i) Differential equation of motion (ii) Natural frequency of oscillation. **(10 Marks)**
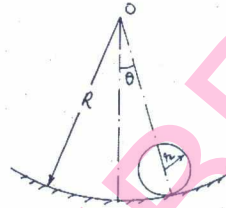

Fig. Q2 (a)

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

3. a. The mass of the spring mass dashpot system is given an initial velocity of ω_n (from equilibrium position), where ω_n is the undamped natural frequency of the system. Find the equation of motion for the system when $\xi = 2$. **(10 Marks)**
   b. Determine the value of C such that the system shown in Fig. Q3 (b) is critically damped, if m = 10 kg and K = 10,000 N/m. **(05 Marks)**
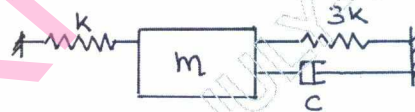

Fig. Q3 (b)

   c. Show that logarithmic decrement $\delta = \dfrac{1}{n}\ln\left(\dfrac{x_0}{x_n}\right)$ where x_0 is the initial amplitude and x_n is the amplitude after n cycles. **(05 Marks)**

4. a. A 50 kg fan has a rotating unbalance of magnitude 0.1 kgm. The fan is mounted on the free end of a Cantilever beam of length 1.2 m. Find the steady state amplitude of the fan when it operates at 1000 rpm. The Young's modulus of elasticity of the Cantilever beam material is 210 GPa and moment of inertia is 1.3×10^{-6} m^4. The beam is specially treated to add viscous damping of $\xi = 0.08$. **(10 Marks)**
   b. An air compressor of 450 kg operates at a constant speed of 1750 rpm. The reciprocating part is 10 kg and Crank radius is 100 mm. Specify the spring for the mounting such that only 20% of the unbalanced force is transmitted to the foundation when (i) damping ratio $\xi = 0$ and (ii) damping ratio $\xi = 0.15$. **(10 Marks)**

1 of 2

PART – B

5 a. A commercial vibration pick up has a damped natural frequency of 4.5 Hz and a damping ratio 0.75. What is the range of impressed frequency at which the amplitude can be read directly from the pick up with an error not exceeding 2% of the actual amplitude? **(10 Marks)**

   b. The rotor of mass 9 kg is placed at the center of a 25 mm diameter steel shaft 40 cm between bearings. Determine
      - (i) The critical speed of shaft.
      - (ii) The amplitude of vibration of the rotor at a speed of 3600 rpm, if the eccentricity is 0.15 mm and
      - (iii) The vibratory force transmitted to the bearings at this speed.

      Assume the shaft to be simply supported and neglect the weight of the shaft. Take $E = 2.1 \times 10^{11} \, \text{N/m}^2$. **(10 Marks)**

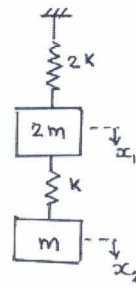6 a. Find the natural frequencies of the system shown in Fig. Q6 (a). **(10 Marks)**

Fig. Q6 (a)

   b. Find the natural frequencies of the system shown in Fig. Q6 (b). Assume that there is no slip between the cord and the cylinder. Give $K_1 = 60$ N/m, $K_2 = 40$ N/m, $m = 2$ kg and $M = 10$ kg. **(10 Marks)**
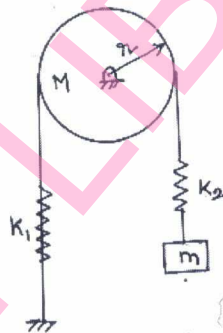

Fig. Q6 (b)

7 a. State and prove Maxwells reciprocal theorem. **(08 Marks)**

   b. Find the lowest natural frequency of vibration for the system shown in Fig. Q7 (b) by Rayleighs method. Take $E = 1.96 \times 10^{11} \, \text{N/m}^2$, $I = 4 \times 10^{-7} \, \text{m}^4$, $m_1 = 100$ kg and $m_2 = 50$ kg. **(12 Marks)**
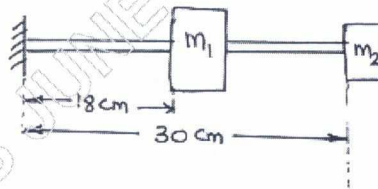

Fig. Q7 (b)

8 a. Sketch and explain the arrangement for experimental modal analysis. **(08 Marks)**

   b. Explain the following: (i) Breakdown maintenance   (ii) Preventive maintenance (iii) Condition based maintenance. **(09 Marks)**

   c. List the various techniques for machine condition monitoring. **(03 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2018
Hydraulic & Pneumatics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. State Pascal's law. **(02 Marks)**
   b. With a neat diagram, explain the working principle of a typical hydraulic gear pump. **(08 Marks)**
   c. An axial piston pump running at 2500 rpm. It has 9 number of 15 mm dia. pistons arranged on 120 mm pitch circle diameter and volumetric efficiency is 90%. Find the offset angle of the pump. **(10 Marks)**

2 a. What is an actuator? State its broad classification. **(03 Marks)**
   b. Explain the following single acting cylinders with neat sketches (any three):
      (i) Gravity type. (ii) Spring type. (iii) Telescopic
      (iv) Tandem. **(09 Marks)**
   c. A hydraulic motor has a volumetric displacement of 123 cm^3. Operating at a pressure of 60 bars and speed of 1800 rpm. If the actual flow rate consumed by the motor is 0.004 m^3/sec and the actual torque delivered by the motor is 100 Nm. Find all three efficiencies and actual power delivered by the motor. **(08 Marks)**

3 a. How control valves are classified? **(03 Marks)**
   b. Explain with a neat sketch the working of a Direct Acting Pressure Relief valve. **(07 Marks)**
   c. Describe the working of $\frac{5}{3}$ DC valve with 4 ways with neat sketches. Also draw its graphical symbol. **(10 Marks)**

4 a. What is the principle and purpose of a representative circuit? Explain the working of a typical regenerative circuit with a neat sketch. **(10 Marks)**
   b. What is an accumulator? Explain with a neat circuit diagram the use of accumulator as a hydraulic shock absorber. **(10 Marks)**

PART – B

5 a. What is a seal and what are its functions? Explain sealing devices used in hydraulic systems. **(10 Marks)**
   b. What is filter and how they are classified? **(04 Marks)**
   c. Explain the possible situations of incorrect flow with its reasons and remedies. **(06 Marks)**

6 a. What is cushioning of cylinders? Why Cushioning is necessary? Explain the working of a typical cushioned cylinder. **(10 Marks)**
   b. Explain the different operational type principles used for the construction of Rodless cylinders. **(10 Marks)**

7   a. Explain the different methods employed for controlling the speed of pneumatic cylinders with neat sketches. **(10 Marks)**

     b. What is the function of a time-delay valve? Explain the constructional features of a typical time-delay valve with a neat sketch. **(10 Marks)**

8   a. What is signal overlap? Explain the methods of solution to signal overlapping. **(08 Marks)**

     b. Explain with a neat sketch, the working of air lubrication. **(08 Marks)**

     c. Explain the different methods of distribution of compressed air. **(04 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2018
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. *Hand book / Charts / Tables are not permitted.*

## PART – A

1 a. Four products are processed successively on two machines. The manufacturing times in hours per unit of each product are tabulated below:

Machine	Time per unit (hr)			
	Product 1	Product 2	Product 3	Product 4
1	2	3	4	2
2	3	2	1	2

The total cost of producing one unit of each product is based directly on the machine time. Cost per hour for machines 1 and 2 is Rs. 10 and 5 respectively. The total hours available on machines 1 and 2 are 500 and 380. If the sales price per unit for products 1, 2, 3 and 4 are Rs. 65, 70, 55 and 45 respectively, formulate the problem as a LPP to maximize total net profit. **(10 Marks)**

b. Feasible zone ABCDE identified by a set of constraints is shown in Fig. Q1 (b). If a constraint $x \le 2y$ is added, identify the new feasible zone. Also identify and state all redundant constraints.
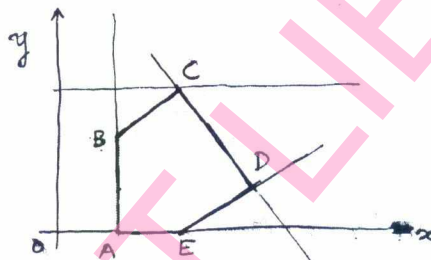
Co-ordinates of,
$A \equiv (1, 0)$
$B \equiv (1, 2)$
$C \equiv (2, 3)$
$D \equiv (4, 1)$
$E \equiv (2, 0)$

Fig. Q1 (b)

Determine maximum and minimum value of Z if $z = 3x + 5y$, after the inclusion of additional constraint. **(10 Marks)**

2 a. Solve the following LPP by Big-M method.
Min $z = 4x_1 + x_2$
Subject to constraint $3x_1 + x_2 = 3$
$$4x_1 + 3x_2 \ge 6.$$
$$x_1 + 2x_2 \le 4$$
$$x_1, x_2 \ge 0$$ **(10 Marks)**

b. Consider the following LPP,
Max. $z = 5x_1 - 6x_2 + 12x_3$

Subject to constraint $x_1 + 3x_2 + 3x_3 \le 90$ and $x_1, x_2, x_3 \ge 0$

   (i)   Find all basic solutions and thus obtain the optimum solution.
   (ii) Find the optimum solution by simplex method.
   (iii) Write the dual for the given primal. **(10 Marks)**

3 a. For the following unbalanced transportation problem, penalty costs per unit of unsatisfied demand are Rs. 5, 3 and 2 for destinations 1, 2 and 3 respectively. Find the optimum solution. **(12 Marks)**

Destination

	1	2	3	
O_1	5	1	7	10
O_2	6	4	6	80
O_3	3	2	5	15
	75	20	50	

b. Solve the following assignment problem for maximization. **(08 Marks)**

Area

		A_1	A_2	A_3	A_4
	S_1	200	150	170	220
Salesman	S_2	160	120	150	140
	S_3	190	195	190	200
	S_4	180	175	160	190

4 Solve the following problem using cutting plane algorithm:

Max $z = 200x_1 + 300x_2$

Subject to constraint : $2x_1 + 4x_2 \leq 17$

$$3x_1 + 3x_2 \leq 15$$

$x_1, x_2 \geq 0$ and integer. **(20 Marks)**

PART – B

5 a. In order to construct network, a project has been represented as shown in Fig. Q5 (a). Can it be considered as a network? If can not be considered, then state the rules which have been violated? **(08 Marks)**
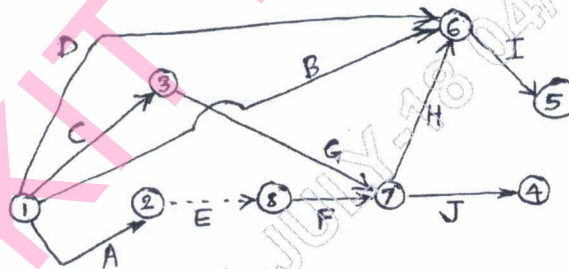

Fig. Q5 (a)

b. A project consists of twelve activities (A to L) with the following precedence:
   (i) A, B, C are first ones and can start simultaneously.
   (ii) A, B < D
   (iii) B < E, F, H
   (iv) F, C < G
   (v) E, H < I, J
   (vi) C, D, F, J < K
   (vii) K < L.

Duration of activities are listed below:

Activity:	A	B	C	D	E	F	G	H	I	J	K	L
Duration (days):	6	4	10	1	1	3	14	6	9	2	7	5

Construct the network and find the critical path and also duration of project. **(12 Marks)**

6 a. Explain in brief the following terms related to 'Service discipline', with example:
(i) First In First Out   (ii) Last In First Out   (iii) Priority service
(iv) Random service.   **(08 Marks)**

b. The number of customers approaching the tailor appear to be Poisson distributed with a mean of 6 customers per hour. The tailor attends the customers on FIFO basis. The tailor can attend the customers at an average of 10 per hour with the service time exponentially distributed. Find
(i)   The average idle time of tailor on a 10-hour working day.
(ii)   The expected number of customers waiting for tailor's services.
(iii)   Probability of having exactly 3 customers in the tailor's shop.
(iv)   Probability of having 3 or less customers in the shop.   **(12 Marks)**

7 a. Use dominance to reduce the following game to 2×2 and then solve.   **(08 Marks)**

		B			
		B_1	B_2	B_3	B_4
	A_1	3	2	4	0
A	A_2	3	4	2	4
	A_3	4	2	4	0
	A_4	0	4	0	8

b. Solve the following game graphically,

		B			
		1	2	3	4
A	A_1	2	2	3	-1
	A_2	4	3	2	6

If the given problem possesses multiple optimum solutions, find two solutions.   **(12 Marks)**

8 a. Determine the optimal sequence of performing 5 jobs on 4 machines. The machining of each job is in the order ABCD and machining times are as follows:

Job	Machine			
	A (hr)	B (hr)	C (hr)	D (hr)
1	8	3	4	7
2	9	2	5	5
3	6	4	5	8
4	12	5	1	9
5	7	1	2	3

Also find the optimum time to complete all jobs.   **(10 Marks)**

b. Using graphical method, determine the minimum time needed to process the two jobs on six machines. The information about the machine sequence and the time required by each job is given below: **(10 Marks)**

Job 1

Order:	A	B	C	D	E	F
Time (hr)	4	5	1	3	6	5

Job 2

Order:	B	A	C	F	D	E
Time (hr)	6	3	2	4	3	5

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10ME754

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   What are the conventional and non – conventional energy sources? Describe briefly.
         (10 Marks)
    b.   With sketches, explain the production of oil from oil shale and Tar sands. Mention the limitations.   **(10 Marks)**

2   a.   Define the following terms :   **(08 Marks)**
         i) Zenith angle   ii) Local solar time   iii) Declination angle   iv) Hour angle.
    b.   With the help of a neat sketch, explain the working principle of sunshine recorder.
         (06 Marks)
    c.   Calculate the local apparent time (LAT) corresponding to 13 – 30(IST) on July 16, 1998 at Delhi (28^0 35' N , 77^0 12' E). The equation of time correction on July 16 is (-6) minutes. Indian standard time (IST) is the local civil time corresponding to 82.50^0 E longitudes. Also calculate the declination.   **(06 Marks)**

3   a.   With the help of usual expression, explain Diffuse radiation and reflected radiation on the tilted surface.   **(06 Marks)**
    b.   With a neat sketch, explain Solar pond.   **(06 Marks)**
    c.   With a neat sketch, describe in detail the working of continuous vapour absorption cooling system.   **(08 Marks)**

4   a.   With neat sketch, explain liquid flat plate collector.   **(10 Marks)**
    b.   For a glass cover system estimate τ_ρ for the following data. Angle of incidence = 45^0 , Number of cover = 2 , Thickness of each cover = 4mm , Refractive index of glass relative to air = 1.52.   **(10 Marks)**

PART – B

5   a.   Explain with a neat sketch, the working of Photo – Voltaic cell. Mention any four application of solar Photovoltaic system.   **(10 Marks)**
    b.   Explain briefly any two types of Horizontal axis wind mills.   **(10 Marks)**

6   a.   With a neat sketch, explain the working of double basin tidal power plant.   **(06 Marks)**
    b.   With a neat sketch, explain the working principle of OTEC (closed) plant.   **(08 Marks)**
    c.   List the advantages and limitations of geothermal energy.   **(06 Marks)**

7   a.   Discuss the factors which affects the Bio – gas production in biogas plant.   **(10 Marks)**
    b.   Classify biogas plant and explain any one plant with neat sketch.   **(10 Marks)**

8   a.   With a neat sketch, explain the working principle of tank type electrolyzer for hydrogen production.   **(10 Marks)**
    b.   What are the different methods for hydrogen storage? Describe their advantages and disadvantages.   **(10 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2018
Product Life Cycle Management

Time: 3 hrs.   Max. Marks:100

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

PART – A

1.   a. Justify the need of Product Life Cycle Management (PLM) in Modern Industry. **(06 Marks)**
    b. Explain the significance of threads of information woven into PLM fabric. **(08 Marks)**
    c. State the purposes of conducting PLM feasible study. **(06 Marks)**

2.   a. Outline atleast four characteristics of PLM, with suitable examples. **(08 Marks)**
    b. Comment on the influence of internal drivers of PLM in an organization. **(08 Marks)**
    c. Brief on the need of PLM validation in ensuring the product quality. **(04 Marks)**

3.   a. With reasons justify the need for implementing Product Data Management (PDM) System. **(06 Marks)**
    b. State the benefits of workflow Management. **(04 Marks)**
    c. Explain : i) Check – in Check - out and ii) Meta Data in connection with PDM. **(10 Marks)**

4.   a. Highlight the importance of Engineering Vaulting in Product Development Cycle. **(05 Marks)**
    b. Explain the role of Engineering change Management in implementing desired product changes effectively. **(06 Marks)**
    c. State the significance of Design for Environment in collaborative product development. **(09 Marks)**

PART – B

5.   a. Briefly explain the tools of communication for collaborative work. **(05 Marks)**
    b. Explain the methods of creating animation for assembly instructions. **(05 Marks)**
    c. How an acrobat 3D document is created? Explain the different steps involved in it. **(10 Marks)**

6.   a. Explain the importance of Parameterization of Design of products. **(08 Marks)**
    b. Discuss the following in connection with optimization of products :
      i) Configuration   ii) Checks   iii) Parameters   iv) Design table. **(12 Marks)**

7.   a. Elaborate on the Role of following phases in digital manufacturing :
      i) Ramp – up Production   ii) Manufacturing first one. **(10 Marks)**
    b. Discuss in detail the concept and benefits of Virtual Learning Curve, with examples. **(10 Marks)**

8.   a. List and explain the PLM initiatives in supporting corporate objectives. **(10 Marks)**
    b. Explain the process of implementing the PLM strategy, with suitable examples. **(10 Marks)**

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