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

Seventh Semester B.E. Degree Examination, Dec.2013 / Jan.2014
Engineering Economy

Time: 3 hrs.   Max. Marks:100

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

PART - A

1 a. Distinguish between strategy and tactics with suitable examples. **(05 Marks)**
   b. Explain the law of demand and supply with suitable example. **(05 Marks)**
   c. Determine the effective interest rate for a nominal annual rate of 6% that is compounded
      i) Semi - annually   ii) Quarterly   iii) Monthly   iv) Daily. **(06 Marks)**
   d. A person invests a sum of Rs 50,000/- in a Nationalized Bank at a Nominal interest rate of
      18% for 15 years. The compounding is monthly. Find the maturity amount of the deposit
      after 15 years? **(04 Marks)**

2 a. State the conditions for present worth comparisons. **(06 Marks)**
   b. Determine the equivalent present worth of the following series of year and cash flows
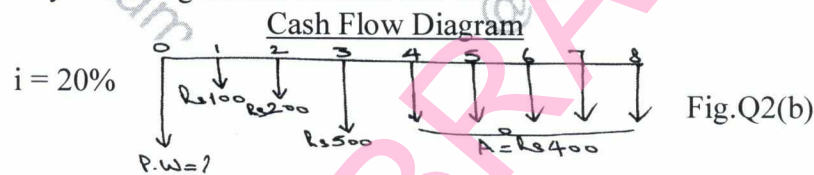   extending over 8 years using annual interest rate of 20%. **(04 Marks)**

Cash Flow Diagram

Fig.Q2(b)

   c. What do you understand by present worth by T2 rule? **(03 Marks)**
   d. An Entrepreneurs intending to start a New Business knows that the first few years are the
      most difficult. To Lessen the chance of failure a loan plan for start up capital is proposed in
      which interest paid during the first two years will be at 3%, 6%. For the next 2 years if 12%
      For the last 2 years of the 6 years loan. How large a loan can be justified for proposed
      repayments at the end of 2, 4 and 6 respectively for Rs 20,000/- , Rs 30,000 and Rs 50,000/-
      for 2nd , 4th and 6th year respectively. **(07 Marks)**

3 a. Two types of power converter Alpha and Beta are under consideration for a particular
      application. An economic comparison is to be made at an interest rate of 10%. 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 10,000/-	Rs 25,000/-
Estimated service life	5 years	9 years
Salvage value	Rs 3,000/-	Rs 5,000/-
Annual operating cost	Rs 2500/-	Rs 1200/-

   b. A Conventional Agricultural Equipment has a service of 6 years. A newly designed
      equipment is 50% costlier than the conventional one but has many advantages. The
      operating costs of both these equipment are almost same and salvage value is negligible.
      What will be the service life of the New equipment that makes its cost comparable to that of
      the conventional one at i = 10%? **(10 Marks)**

4 a. Define the following terms : i) MARR   ii) IRR   iii) ERR. **(06 Marks)**
   b. Explain the causes for depreciation. **(06 Marks)**
   c. An XYZ company has purchased an equipment whose first cost is Rs 2,00,000 with an
      estimated life of 8 years. The estimated salvage value of the equipment is Rs 40,000 at the
      end of its life time. Determine the depreciation charge and book value at the end of various
      years using SOYD method. **(08 Marks)**

PART - B

5 a. What are the different elements of cost? Explain. **(04 Marks)**

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

c. From the following data related to manufacturing a standard product for the month of Sept – 2012, prepare a statement showing the cost and profit per unit.
1. Raw Material used = 40,000
2. Direct wages = 24,000
3. Machine hours worked = 9,500 hrs
4. Machine hour rate @ Rs 4/hr
5. Office overhead 20% of works cost
6. Selling overhead @ Rs 1/unit
7. Units produced = 20,000
8. Units sold 18,000 @ Rs 10/unit. **(12 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. Following is the Financial status of a company as on 31st March 2005, prepare a Balance sheet as on 31st March 2005. **(10 Marks)**

Particulars	Amount (Rs)
Cash in hand	22,000
Sundry debtors	10,000
Bank loan's	40,000
Bill's payable	20,000
Equity shares	1,13,000
Land & Buildings	50,000
Plant & Machinery	90,000
Inventories	15,000
Creditors	30,000
Bank Balances	16,000

7 a. What is a Financial Ratio? Explain Liquidity and Solvency ratio's, mentioning their significance. **(10 Marks)**

b. Calculate the Current Assets of XYZ company, with the following information.
i) Stock turnover = 5 times ii) Stock at the end = 5000 more than the stock at the beginning iii) Sales = Rs 2,00,000/- iv) Gross profit ratio = 20% v) Current liabilities = Rs 60,000 vi) Quick ratio = 0.75. **(10 Marks)**

8 a. Briefly explain the objectives of profit planning. **(05 Marks)**

b. On 2006 June Abhilash Enterprises has Rs 10,000 cash balance. The expected sales are to the value of Rs 7,000/-, Rs 12,000/- and Rs 15,000/- respectively. It is estimated that the disbursement is to be made in 3 months are Rs 15,000/- , Rs 16,000/- and Rs 12,000/-. Whenever a shortage occurs Bank loan is assumed to be raised to a value of Rs 5,000/-. Prepare a cash budget and show the cash balance at the beginning of September. **(08 Marks)**

c. Prepare a purchase budget from the following particulars when the estimated price/kg is X – Rs 2 , Y – Rs 3 , Z – Rs 4.

Materials	Estimated consumption of Materials in kgs
X	1,00,000
Y	2,00,000
Z	2,50,000

Materials	Stock at the Beginning	Stock at the end Estimated
X	30,000	15,000
Y	40,000	20,000
Z	45,000	50,000

(07 Marks)

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Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014
Mechanical Vibrations

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. With a sketch, explain the beats phenomenon and obtain its resultant motion. **(10 Marks)**

   b. If $x(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos nwt + \sum_{n=1}^{\infty} b_n \cos nwt$, where x(t) us a periodic, nonharmonic, obtain expressions for a_0, a_n and b_n. **(10 Marks)**

2 a. What is the effect of mass of a spring on its natural frequency? Derive. **(10 Marks)**

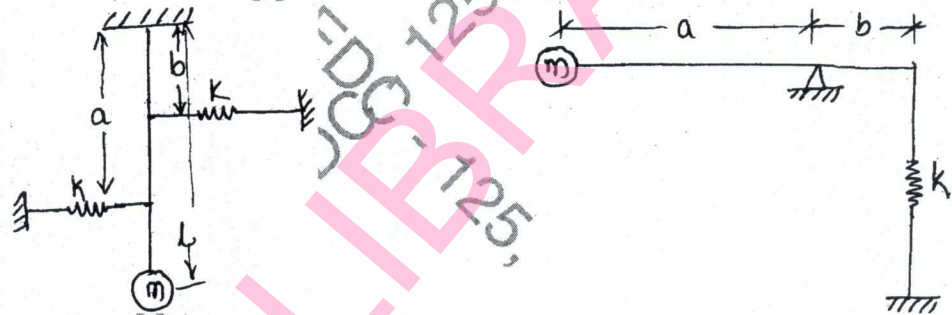   b. Find the natural frequencies of Fig. Q2(b). **(10 Marks)**

Fig. Q2(b)

3 a. For an under damped system, derive an expression of response equation. **(10 Marks)**

   b. A vibrating system having a mass 3 kg, spring stiffness of 100 N/m and damping coefficient of 3 N – sec/m. Determine damping ratio, damped natural frequency, logarithmic decrement, ratio of two consecutive amplitudes and number of cycles after which the original amplitude is reduced to 20%. **(10 Marks)**

4 a. Analyse the undertamped system subjected to constant harmonic excitation and show the complete solution. **(12 Marks)**

   b. A vibrating system having mass 100 kg is suspended by a spring of stiffness 19600 N/m and is acted upon by a harmonic force of 39.2 N at the undamped natural frequency. Assuming visious damping with a coefficient of 98 N – sec/m. Determine resonant frequency, phase angle at resonance, amplitude at resonance, the frequency corresponding to the peak amplitude and damped frequency. **(08 Marks)**

PART – B

5 a. Mention the instruments used to measure displacement and acceleration. Discuss the relevant frequency response curves. **(10 Marks)**

   b. Derive an expression for amplitude of a whirling shafts with air damping. **(10 Marks)**

6 a. Discuss the effect f mass ratio on frequency ratio of an undamped dynamic vibration absorber with derivation. **(12 Marks)**

b. Two equal masses are attached to a string having high tension as shown in the Fig. 6(b). Determine the natural frequencies of the system. **(08 Marks)**

Fig. Q6(b)

7 a. Determine the influence coefficients of the triple pendulum system as shown in Fig. 7(a).

Fig. Q7(a)

(10 Marks)

b. Use the Stodola method to determine the lowest natural frequency of four degrees of freedom spring mass system as shown in Fig. 7(b).

Fig. Q7(b)
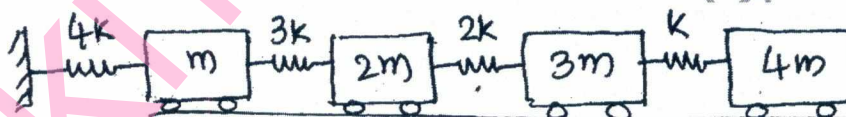
(10 Marks)

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

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10ME74

Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
Operations Research

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Old hens can be brought at Rs.50/- each and young hens can be brought at Rs.100/- each. The old hens lay 3 eggs/week and young hen's 5/week. Each egg cost 2 Rs. A hen cost Rs.5/week to feed, if a person has only Rs.2000 to spend for hens, formulate the problem to decide how many of each kind of hens should be buy? And he cannot house more than 40 hens, formulate the problem a LPP model. **(10 Marks)**

b. Solve the following LPP by Graphical method,

$Z_{max} = 3x_1 + 4x_2$

Subject to constraints,

$5x_1 + 4x_2 \leq 200$
$3x_1 + 5x_2 \leq 150$
$5x_1 + 4x_2 \geq 100$
$8x_1 + 4x_2 \geq 80$

$x_1 \ \& \ x_2 \geq 0$ **(10 Marks)**

2 a. Solve the following LPP using Simplex method:

$Z_{max} = 10x_1 + 5x_2$

Subject to constraints,

$4x_1 + 5x_2 \leq 100$
$5x_1 + 2x_2 \leq 80$

$x_1 \ \& \ x_2 \geq 0$ **(08 Marks)**

b. Solve the given problem by using Big.M.

$Z_{min} = 5x_1 + 3x_2$

Subject to constraints,

$2x_1 + 4x_2 \leq 12$
$2x_1 + 2x_2 = 10$
$5x_1 + 2x_2 \geq 10$

$x_1 \ \& \ x_2 \geq 0$ **(12 Marks)**

3 a. Find the optimality for given problem and initial solution by using VAM method. **(10 Marks)**

Destinations Origin	W₁	W₂	W₃	W₄	Supply
F₁	2	2	2	1	3
F₂	10	8	5	4	7
F₃	7	6	6	8	5
Demand	4	3	4	4	

10ME74

b. A AML company has 5 tasks and 5 persons to perform. Determine the optimal assignment and to minimize the total cost. **(10 Marks)**

Jobs		Machines			
	A	B	C	D	E
P	6	7	5	9	4
Q	7	5	10	9	6
R	5	4	3	6	5
S	8	3	5	6	4
T	4	7	5	6	6

4 a. A traveling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and return to his starting point find the least cost route. **(10 Marks)**

	A	B	C	D	E
A	8	4	10	14	2
B	12	6	10	4	
C	16	14	8	14	
D	24	8	12	10	
E	2	6	4	16	8

b. What is integer programming? Why it is needed and write the branch and bound algorithm. **(10 Marks)**

PART – B

5 a. The following table gives the activities in a construction project and other related information: **(14 Marks)**

Activity	t₀	tₘ	tₚ
1 – 2	20	30	46
1 – 3	9	12	21
2 – 3	5	7	
2 – 4	2	3	4
3 – 4	1	2	3
4 – 5	12	18	24

i) Draw a pert network
ii) Calculate project duration
iii) Find the critical path.
iv) Find the probability that the project will be completed within 50 days.

b. Define the following: i) Normal time   ii) Crash time   iii) Free float **(06 Marks)**

6 a. Define: i) Fair game   ii) Pure strategy   iii) Mixed strategy **(06 Marks)**

b. Use dominance rule to find the optimum strategies for both the player. **(07 Marks)**

		B₁	B₂	B₃	B₄	B₅	B₆
	A₁	4	2	0	2	1	1
	A₂	4	3	1	3	2	2
Player	A₃	4	3	7	-5	1	2
	A₄	4	3	4	-1	2	2
	A₅	4	3	3	-2	2	2

c. Solve the game by graphically method. **(07 Marks)**

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \end{bmatrix}$$

7 a. Write the characteristics of waiting lines. **(05 Marks)**

   b. At what average rate must a clerk at super market 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 arrived 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 customer in a saloon.

   ii) Average waiting time of customer before service.

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

8 a. Define the following:

   i) Idle time   ii) Total elapsed time **(04 Marks)**

   b. Write the assumption underlying the sequencing problem. **(04 Marks)**

   c. Find the sequence that minimizes the total elapsed time, idle time and normal time.

Machine	Jobs				
	A	B	C	D	E
M₁	6	8	7	10	6
M₂	3	2	5	6	4
M₃	4	8	6	7	8

(12 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2013 / Jan. 2014
Non – Conventional Energy Sources

Time: 3 hrs. Max. Marks:100

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

PART - A

1 a. Discuss with the help of recent statistics commercial and non – commercial energy reserves and production in India. **(10 Marks)**

b. Explain the advantages and limitations of the use of non – conventional sources of energy. **(10 Marks)**

2 a. Explain the following : i) Solar constant   ii) Solar radiation data of India. **(06 Marks)**

b. Sketch and explain the working of shading ring pyrheliometer. **(08 Marks)**

c. Calculate the day length of location (latitude 22^0 00' W, 73^0 10' E) during the month of March. **(06 Marks)**

3 a. Name the different types of solar thermal power cycles and explain any one type, with a neat sketch. **(10 Marks)**

b. With the help of usual expression, explain the beam, diffuse and reflected solar radiation on the tilted surfaces. **(10 Marks)**

4 a. Explain transmissivity based on reflection refraction in relation to flat plate solar collector covers. **(06 Marks)**

b. Two glass covers each 3mm thick have refractive index of 1.526 and an extinction coefficient 'K' of 0.0161mm. Calculate the transmittance taking into account the absorption and reflection both for normal incidence and an angle of incidence of 75^0 and also find the absorbtance transmittance product, if absorbtance of the absorber plate is 0.94. **(08 Marks)**

c. Write short notes on: i) Solar collector heat loss coefficient   ii) Solar collector performance. **(06 Marks)**

PART - B

5 a. List the four important applications of solar photovoltaic system. **(04 Marks)**

b. With a neat sketch, explain the horizontal axis wind machine. **(08 Marks)**

c. Wing at 1 standard atmospheric pressure and 20^0C has velocity of 10m/second. Calculate
   i) The total power density in the wind stream   ii) Maximum power density   iii) Actual power density, assuming $\eta = 30\%$ iv) Total power produced, if the turbine diameter is 120 m. **(08 Marks)**

6 a. Explain the mechanism of wave motion. **(06 Marks)**

b. With the neat sketch, explain the working principle of OTEC (closed) plant. **(08 Marks)**

c. State the environmental problem associated with geothermal energy conversion. **(06 Marks)**

7 a. List the factors affecting bio gas generation. Explain any four, in brief. **(10 Marks)**

b. What are the main applications of bio gas? Explain briefly the sources of production of biomass. **(10 Marks)**

8 a. What are the different methods for hydrogen production? Explain in brief. **(10 Marks)**

b. Write short notes on :   i) Safe utilization of hydrogen energy   ii) Hydrogen transportation. **(10 Marks)**

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USN | | | | | | | | | | **10ME758**

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. With the help of a neat sketch, explain TQM framework.   **(10 Marks)**
   b. Define quality. Mention the dimensions of quality with meaning and example. **(10 Marks)**

2 a. Briefly explain the seven steps to strategic planning.   **(10 Marks)**
   b. Why quality council is established? What are the duties of quality council? **(10 Marks)**

3 a. What actions organisation take to handle customer complaints?   **(10 Marks)**
   b. Define the term team. Why teams work?   **(04 Marks)**
   c. Briefly explain the different types of teams.   **(06 Marks)**

4 a. Explain Juran trilogy with a neat sketch.   **(10 Marks)**
   b. What do you mean by Quality Function Deployment? What are the benefits of Quality Function Deployment? **(10 Marks)**

PART – B

5 a. With the help sketches, explain tree diagram.   **(10 Marks)**
   b. Discuss the following in brief : i) Nominal Group Technique ii) Affinity diagram. **(10 Marks)**

6 a. With a sketch, explain Pareto diagram and mention the steps involved in its construction. **(10 Marks)**
   b. What are the some common questions asked while investigating an out – of – control process? **(10 Marks)**

7 a. Explain the following in brief : ISO 9000 series of standards.   **(10 Marks)**
   b. With neat sketch, explain the Malcolm Baldrige model for excellence in business performance. **(10 Marks)**

8 a. Explain briefly quality by design tools for product development.   **(15 Marks)**
   b. Mention the quality by design tools for production.   **(05 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
Robotics

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 the types of robot.   **(06 Marks)**
    b. Explain the following robot joints: i) Rotary joint; ii) Spherical joint.   **(14 Marks)**

2 a. Discuss the kinematics of SCARA manipulator by using link transformation matrix.
                                                                                   (10 Marks)
    b. Explain the inverse kinematics for a 3R manipulator.   **(10 Marks)**

3 a. Explain the features of Jacobian matrix for a serial manipulator.   **(10 Marks)**
    b. Explain the singularity in force domain.   **(06 Marks)**
    c. Explain the static's of parallel manipulator.   **(04 Marks)**

4 a. Illustrate the equation of motion of a planar 2R manipulator using Lagrangian formulation.
                                                                                   (12 Marks)
    b. Discuss the inertia of a link by using a rigid body.   **(08 Marks)**

PART – B

5 a. Explain the joint space schemes.   **(06 Marks)**
    b. Explain the cubic trajectory with a via point.   **(08 Marks)**
    c. Cartesian circular motion planning. Explain.   **(06 Marks)**

6 a. Briefly explain the feed back control of a single link manipulator for a first order system.
                                                                                   (10 Marks)
    b. PID control of a multi link manipulator.   **(10 Marks)**

7 a. With the help of a neat sketch, explain the working of a brushless D.C. motor. **(06 Marks)**
    b. Explain the types of actuating system.   **(06 Marks)**
    c. Explain the operation principles of a stepper motor and its characteristics. **(08 Marks)**

8 Write short notes on:
    a. LVDT.
    b. Piezoelectric sensors.
    c. Eddy current proximity sensor.
    d. Capacitive sensor.
    e. Optical sensor.
                                                                                   (20 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
Product Life Cycle Management

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Define PCM, explain the phases of PCM enumerating examples for the same. **(10 Marks)**
   b. List the components of PCM and explain the data management involved in the threads of
      PCM.   **(10 Marks)**

2 a. List and explain any four characteristics of PCM.   **(10 Marks)**
   b. What are PCM elements? Explain the external drivers of PCM.   **(10 Marks)**

3 a. Explain the PDM implementation for aerospace industries.   **(10 Marks)**
   b. What are the flow process involved in the workflow management.   **(10 Marks)**

4 Write short notes on the following:
   a. Smart parts.
   b. Prototype development.
   c. Virtual testing.
   d. Engineering change management.   **(20 Marks)**

PART – B

5 a. Write the ways of creating an animation for assembly instructions.   **(10 Marks)**
   b. Using suitable software explain the schematics of CAD drawings.   **(05 Marks)**
   c. Briefly explain the tools of communication for collaborative work.   **(05 Marks)**

6 a. Write the design parameterization giving suitable example of an automotive product.
                                                                                (10 Marks)
   b. Explain the parameters considered for knowledge and design optimization. **(10 Marks)**

7 a. What is digital manufacturing? List and explain the concepts of manufacturing the first
      component.   **(10 Marks)**
   b. Explain the concepts of virtual learning curve.   **(05 Marks)**
   c. Briefly explain the production planning giving suitable example.   **(05 Marks)**

8 a. Explain the process of implementing the PCM strategy with suitable examples. **(10 Marks)**
   b. With the fundamentals of PCM strategy explain its impact.   **(10 Marks)**

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