

Seventh Semester B.E. Degree Examination, June/July 2014
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 compounding interest factors tables is permitted.

PART – A

- 1 a. What is decision making? Explain the importance of decision making in engineering economics. (06 Marks)
- b. Discuss the interest rate from borrower's and lender's point of view. (08 Marks)
- c. If Mr. XYZ plans to deposit money in a bank, that pays 18% per year compounded daily. What effective rate will he receive (i) yearly (ii) semiannually (iii) quarterly. (06 Marks)
- 2 a. Three devices are available to perform a necessary function for 3 years. The initial cost (negative) for each device at time 0 and subsequent annual savings (positive) are shown in the following table. Compare the net present worth of these three devices, when the required interest rate is 12%. Draw the cash flow diagram. (08 Marks)

Year	0	1	2	3
Device-1	₹ 22,000	5,000	7,000	9,000
Device-2	₹ 24,000	8,000	8,000	8,000
Device-3	₹ 20,000	6,000	6,000	10,000

- b. A new piece of material handling equipment costs ₹5,00,000 and is expected to save ₹2,00,000 the first year of operation. Maintenance and operating costs increases are expected to reduce the net savings by ₹10,000 per year for each additional year of operations until the equipment is worn out at the end of 8 years. Determine the net present worth of the equipment at an interest rate of 10 percent. (06 Marks)
- c. Calculate the capitalized cost of a project that has an initial cost of ₹2,50,000 and an additional investment of that project is ₹50,000. The annual expenditure for the project estimated to be ₹10,000. In addition ₹5000 will be required for the every 10 years. Assume that $i = 15%$ per year. (06 Marks)
- 3 a. The following costs are estimated for two equal service machines in a manufacturing plants.

	Machine – 1	Machine – 2
First cost (₹)	2,60,000	3,60,000
Annual maintenance cost (₹)	8,000	3,000
Annual labour cost (₹)	1,10,000	70,000
Extra income taxes (₹)	-	26,000
Salvage value (₹)	20,000	30,000
Life (years)	4	4

If the minimum required rate of return is 15% per year, which machines should be selected? (10 Marks)

- b. Two machine models A and B perform the same function. Type A machine has a low initial cost of ₹75,000 relatively high operating cost of ₹15,000 per year more than those of type B machine and a short life of 4 years. Type B machine cost ₹1,00,000 and operating cost of ₹5,000 per year can be kept in service economically for 8 years. The scrap value from either machine at the end of the life will barely cover its removal cost. Which is preferred using an equivalent annual cost, when the minimum attractive rate of return is 9 percent?

(10 Marks)

- 4 a. Explain the following :
 (i) Internal rate of return (IRR) (ii) External rate of return (ERR) (08 Marks)
 b. Define depreciation and lists its causes. (06 Marks)
 c. A machine is purchased for ₹10,000 the estimated life of the machine is 4 years and the scrap value is ₹400. The rate of interest on the depreciation fund is 4 percent. Calculate the book value of the machine at the end of each year using sinking fund method. (06 Marks)

PART – B

- 5 a. Explain the different elements of cost. (06 Marks)
 b. What are the different methods of cost estimating? Explain briefly. (06 Marks)
 c. A firm is producing 100 units per day. The direct material cost is found to be ₹1600, the direct labour cost ₹2000 and factory overheads chargeable to it ₹2500. If the selling on cost is 40% of the factory cost, what must be the selling price of each unit to realize a profit as 16.6% of the selling price? (08 Marks)
- 6 a. Explain the relation between balance sheet and profit and loss account. (08 Marks)
 b. The following are the financial statements of ABC company Ltd.:

	₹
Share capital	60,000
Debtors	54,000
Creditors	30,000
Share premium	21,000
Reserves and surplus	39,000
Inventory	63,000
Dividend payable	10,800
Land and Building	14,400
Cash in hand	13,200
Bank overdraft	6,900
Plant and Machinery	32,400
Long term loan	10,200
Other assets	900

Prepare the balance sheet. (12 Marks)

- 7 a. What are the advantages and disadvantages of financial ratio analysis? (08 Marks)
 b. The ABC company has made plans for the next year. It is estimated that the company will employ total assets of ₹8,00,000. 50percent of the assets being financial by borrowed capital at an interest cost of 8% per year. The direct cost for the year are estimated at ₹4,80,000 and all other operating expenses are estimated at ₹80,000. The goods will be sold to customers at 150 percent of the direct costs. Tax rate is assumed to be 50 percent. Calculate (i) Net profit margin (ii) return on assets (iii) assets turn over (iv) return on owner's equity. (12 Marks)
- 8 a. What are the objectives of profit planning? (06 Marks)
 b. Discuss the importance of financial analysis. (06 Marks)
 c. What are the types of budgets? Explain in brief. (08 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2014
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. Add the following harmonic motions analytically and check the solution graphically:
 $x_1 = 4 \cos (wt + 10^\circ)$
 $x_2 = 6 \sin (wt + 60^\circ)$ (10 Marks)
- b. Develop the Fourier series for the curve shown in Fig.Q.1(b). (10 Marks)

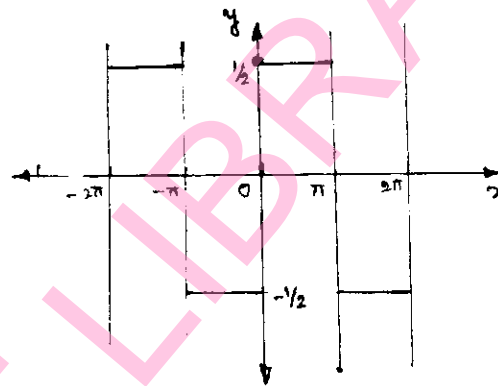


Fig.Q.1(b)

- 2 a. Explain the energy method of finding natural frequency of a spring-mass system. (08 Marks)
- b. Find the natural frequency of the spring controlled simple pendulum shown in Fig.Q.2(b).
Neglect the mass of the rod. (06 Marks)

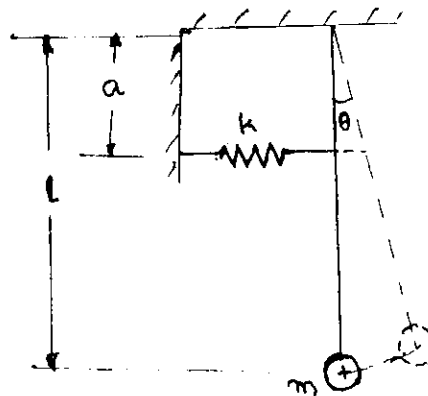


Fig.Q.2(b)

- c. For the system shown in Fig.Q.2(c) find mass m if the system has a natural frequency of 10Hz.

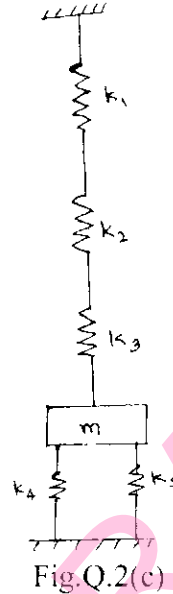
Take $k_1 = 2 \text{ N/mm}$

$k_2 = 1.5 \text{ N/mm}$

$k_3 = 3 \text{ N/mm}$

$k_4 = k_5 = 0.5 \text{ N/mm}$.

(06 Marks)



- 3 a. Show that the ratio of successive amplitudes of mass in a underdamped, viscously damped spring-mass system is given by
- $$\frac{x_0}{x_1} = e^{\delta} \quad \text{where} \quad \delta = \frac{2\pi\xi}{\sqrt{1-\xi^2}}.$$
- (10 Marks)
- b. A machine of mass 20kg is mounted on a spring and dashpot. The spring stiffness is 10 N/mm and damping is 0.15 N/mm/s. If the mass is initially at rest and a velocity of 100 mm/s is imported to it, determine: i) displacement and velocity of mass as a function of time; ii) displacement and velocity when time is equal to one second. (10 Marks)
- 4 a. Derive an expression for steady state amplitude of vibration of mass in a spring-mass-damper system when the mass is subjected to harmonic excitation. Also find the phase angle between the mass and excitation. (10 Marks)
- b. A vibratory body of mass 150kg supported on springs of total stiffness 1050 kN/m has a rotating unbalance force of 525 N at a speed of 6000rpm. If the damping factor is 0.3, determine:
- Amplitude of vibration and phase angle.
 - Transmissibility ratio and
 - Force transmitted to the foundation.
- (10 Marks)

PART – B

- 5 a. Explain the principle of working of
- Vibrometer (seismometer);
 - Accelerometer.
- (10 Marks)
- b. A rotor of mass 9.5kg is mounted on a 12mm horizontal steel shaft midway between bearings that are 0.6m apart. The mass centre of the disc is 6mm from its geometric centre. If the damping factor is 0.1 and the shaft rotates at 690 rpm, determine the maximum stress in the shaft and compare it with the dead load stress in the shaft. For steel shaft take $E = 1.96 \times 10^{11} \text{ N/m}^2$. (10 Marks)

- 6 a. Explain the principles of dynamic vibration absorber. Derive the necessary equations. (10 Marks)
- b. For the system shown in Fig.Q.6(b) find the natural frequencies and amplitude ratios. Given $m_1 = 10\text{kg}$, $m_2 = 15\text{kg}$ and $k = 320\text{ N/m}$. (10 Marks)

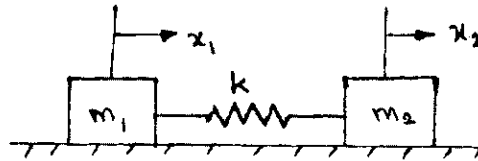


Fig.Q.6(b)

- 7 a. Find the first natural frequency and draw the mode shape for the system shown in Fig.Q.7(a) by matrix iteration method. Take $k_1 = k_2 = k_3 = k$ and $m_1 = m_2 = m_3 = m$. (10 Marks)

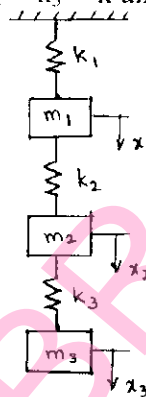


Fig.Q.7(a)

- b. Using Stodola's method, determine the lowest natural frequency of the torsional system shown in Fig.Q7(b). (10 Marks)

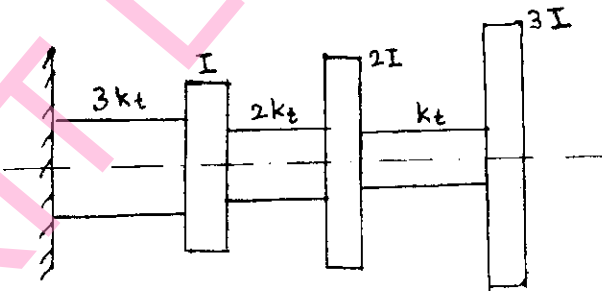


Fig.Q7(b)

- 8 a. Explain the role of i) Exciter; ii) Transducer; iii) Signal conditioner and iv) Analyzer, used in experimental modal analysis. (10 Marks)
- b. Describe the three types of maintenance schemes given below: (06 Marks)
- i) Breakdown maintenance.
 - ii) Preventive maintenance.
 - iii) Condition-based maintenance.
- c. Explain briefly the following methods of condition monitoring: (04 Marks)
- i) Wear debris monitoring.
 - ii) Vibration analysis.

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10ME73

Seventh Semester B.E. Degree Examination, June/July 2014
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. With a neat block diagram, explain the structure of hydraulic power system. (06 Marks)
 - b. With the help of neat sketch, explain the principle of operation of internal gear pump. (06 Marks)
 - c. A pump having a displacement of $14 \text{ cm}^3/\text{rev}$ is driven at 1440 rpm and operates against a maximum pressure of 150 bar. The volumetric efficiency is 0.9 and the overall efficiency is 0.80, calculate (i) The pump delivery in LPM (ii) The input power required at the pump shaft in kW. (iii) The drive torque at the pump shaft. (08 Marks)
2.
 - a. With a neat sketch, explain the second class lever system used with hydraulic cylinders to drive load. (06 Marks)
 - b. Explain with a neat sketch the operation of swash plate piston motor in the hydraulic system. (08 Marks)
 - c. A hydraulic motor having a displacement of 500 ml per revolution, operates at a speed of 75 rpm and is required to develop an output torque of 1200 N-m. The volumetric and mechanical efficiencies of motor are 0.9 and 0.94 respectively. Determine (i) Pressure drop over the motor (ii) Input flow (iii) Overall efficiency. (06 Marks)
3.
 - a. Classify and explain the direction control valves based on the neutral position with symbol. (06 Marks)
 - b. What is pressure compensation? Explain with a neat sketch the working of pressure compensated flow control valve. (10 Marks)
 - c. Draw the hydraulic symbol for the following hydraulic control valves: (i) Simple pressure relief valve (ii) Four way, three position tandem centre solenoid operated DCV (iii) Pressure reducing valve (iv) Shuttle valve. (04 Marks)
4.
 - a. Explain with a neat circuit diagram, Two-handed safety control system. (10 Marks)
 - b. What are the factors affecting synchronization in movement of fluid power ram? Describe any one circuit used in synchronization. (10 Marks)

PART – B

5.
 - a. Sketch and explain the constructional features of reservoir system. (10 Marks)
 - b. With the help of suitable circuit, explain the following : (i) Suction line filtering (ii) Pressure line filtering. (10 Marks)
6.
 - a. State five disadvantages of using air instead of hydraulic oil. (05 Marks)
 - b. Explain the construction of double acting cylinder used in pneumatics with neat sketch. (05 Marks)
 - c. Sketch and explain a cushion assembly for a pneumatic cylinder. (10 Marks)

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.

- 7 a. Explain supply air throttling and exhaust air throttling with neat circuit diagram. (10 Marks)
b. With the aid of circuit diagram, based on “AND” logic function, using two pressure valve, briefly explain the working principle of the circuit. (10 Marks)
- 8 a. List and explain the different types of electrical devices used in control of fluid power system. (06 Marks)
b. Write short notes on :
(i) Air filters (ii) Air driers. (06 Marks)
c. With the aid of a circuit, explain how the sequencing of two pneumatic cylinders can be done by using solenoids, limit switches and valves. (08 Marks)

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SKIT LIBRARY

Seventh Semester B.E. Degree Examination, June/July 2014
Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Use of statistical tables permitted.

PART – A

- 1**
- List and explain the various phases of OR problems. (06 Marks)
 - What are the limitations of OR? (04 Marks)
 - A manufacturer of a line of patent medicines is preparing a production plan on medicines A and B. There are sufficient ingredients available to make 20,000 bottles of 'A' and 40,000 bottles of 'B'. But there are only 45,000 bottles into which either of the medicines can be put. Furthermore, it takes 3 hours to prepare enough material to fill 1,000 bottles of 'A', it takes 1 hour to prepare enough material to fill 1,000 bottles of 'B' and there are 66 hours available for this operation. The profit is ₹8 per bottle for 'A' and ₹7 per bottle for 'B'. Formulate the problem as a LPP and solve by graphical method. (10 Marks)
- 2**
- Define slack, surplus, and artificial variables. (06 Marks)
 - Obtain the dual of the following primal LP problem:
Minimize $Z = x_1 + x_2 + x_3$
Subject to $x_1 - 3x_2 + 4x_3 = 5$; $2x_1 - 2x_2 \leq 3$
 $2x_2 - x_3 \geq 5$; $x_1, x_2 \geq 0, x_3$ unrestricted. (04 Marks)
 - Use Big-M method to solve the following LPP.
Minimize $Z = 4x_1 + 2x_2$
Subject to $3x_1 + x_2 \geq 27$; $-x_1 - 2x_2 \leq -21$
 $x_1 + 2x_2 \geq 30$; $x_1, x_2 \geq 0$ (10 Marks)
- 3**
- A company has plants A, B and C which have capacity to produce 300, 200 and 500 kg respectively of a particular chemical/day. The production cost per kg in these plants are ₹0.70, ₹0.60 and ₹0.66 respectively. Four bulk consumers have placed orders for the products on the following books;

Consumers	Kg required/day	Price offered ₹/kg
I	400	1.00
II	250	1.00
III	350	1.02
IV	150	1.03

Shipping costs in paise/kg from plants to consumers are given below:

		To consumers			
		I	II	III	IV
From Plants	A	3	5	4	6
	B	8	11	9	12
	C	4	6	2	8

Workout the optimum schedule for the above situation considering all the data given.

(12 Marks)

- b. A company has a team of four salesman and there are four districts where the company wants to start its business. The company estimates that the profit/day is given below. Find the assignment of salesman to districts which gives maximum profit.

		Districts			
		I	II	III	IV
Salesman	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

(08 Marks)

- 4 a. Explain the branch and bound method in integer programming. (06 Marks)

- b. Use Gomory's fractional cutting plane method to solve the following IPP.

$$\text{Maximize } Z = x_1 + 4x_2$$

$$\text{Subject to } 2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

(14 Marks)

PART - B

- 5 a. List the differences between PERT and CPM. (05 Marks)

- b. A small project consists of EIGHT activities has the following characteristics.

Activity	Preceding activity	Time estimates (weeks)		
		t_0	t_m	t_p
A	-	2	4	12
B	-	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B, C	9	9	9
G	D	3	3.5	7
H	E, F, G	5	5	5

- (i) Draw the PERT network for the project.

- (ii) Determine the critical path and prepare the activity schedule for the project.

- (iii) If a 30 week deadline is imposed, what is the probability that the project will be completed within the time limit? (15 Marks)

- 6 a. Briefly explain the queuing system and their characteristics. (06 Marks)

- b. A postal clerk can service a customer in 3 minutes. The service time is being exponentially distributed. The inter arrival time of customers is also exponentially distributed with an average of 12 minutes during early morning slack period and an average of 5 minutes during the afternoon peak period. Assess the average queue length and the expected waiting time in the queue during the two periods. (14 Marks)

- 7 a. Explain the following:
 (i) Pay off matrix (ii) Saddle point (iii) Fair game. (05 Marks)
- b. Explain the rule of dominance. (03 Marks)
- c. Use of property of dominance to solve the following game.

		B					
		I	II	III	IV	V	VI
A	I	0	0	0	0	0	0
	II	4	2	0	2	1	1
	III	4	3	1	3	2	2
	IV	4	3	7	-5	1	2
	V	4	3	4	-1	2	2
	VI	4	3	3	-2	2	2

(12 Marks)

- 8 a. State the assumptions made while dealing with sequencing problems. (04 Marks)
- b. Find the sequence for the following six jobs that will minimize the total elapsed time for the three operations: (06 Marks)

Job	1	2	3	4	5	6
Turning (A)	3	12	5	2	9	11
Threading (B)	8	6	4	6	3	1
Knurling (C) (Time in minutes)	13	14	9	12	8	13

- c. Use graphical method to minimize the time required to process the following jobs on the machines. Calculate the total elapsed time to complete the jobs. For each machine specify the job that should be done first. (10 Marks)

	Machines					
Job 1	Sequence :	A	B	C	D	E
	Time (hr) :	6	8	4	12	4
Job 2	Sequence :	B	C	A	D	E
	Time (hr) :	10	8	6	4	12

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10ME758

Seventh Semester B.E. Degree Examination, June / July 2014
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. Define TQM. Briefly explain the approach of TQM. (08 Marks)
 - b. Explain the benefits of TQM. (05 Marks)
 - c. Explain TQM frame work with illustration. (07 Marks)
- 2
 - a. Define leaders. Explain the characteristics of a quality leader. (10 Marks)
 - b. Explain Deming philosophy. (10 Marks)
- 3
 - a. What is customer feed back? Explain different tools used to collect feedback. (10 Marks)
 - b. Enumerate Maslow's hierarchy of needs to involve employee successful implementation of TQM. (10 Marks)
- 4
 - a. Explain the process of Bench marking. (10 Marks)
 - b. Write a brief note on Kaizen. (05 Marks)
 - c. Explain Juran trilogy. (05 Marks)

PART - B

- 5 Explain the following :
 - a. Affinity diagram.
 - b. Tree diagram.
 - c. Matrix diagram.
 - d. Group Technique. (20 Marks)
- 6 Explain the following with examples :
 - a. Scatter diagram.
 - b. Histogram.
 - c. Cause and effect diagram.
 - d. Control charts. (20 Marks)
- 7
 - a. Explain change in culture to implement TQM. (10 Marks)
 - b. Explain: i) Self assessment process ii) Implementing of ISO - 9000. (10 Marks)
- 8
 - a. Explain the tools for concept development. (10 Marks)
 - b. Explain the tools for design optimization. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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10ME766

Seventh Semester B.E. Degree Examination, June/July 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. With a neat sketch, name various type of robot joints and also show their symbols and degrees of freedom. (10 Marks)
- b. Find the resultant rotation matrix with Euler's angle representation for rotation in sequence:
 - i) i)Rotation of Ψ about u axis ($R_u\Psi$) – Yaw
 - ii) Rotation of θ about v axis ($R_v\theta$) – pitch
 - iii) Rotation of ϕ about w axis ($R_w\phi$) – Roll (10 Marks)
- 2 a. Draw a neat diagram of SCARA manipulator and find the final transformation matrix of end effectors using D-H parameter and write the equation of position and orientation. (14 Marks)
- b. Explain direct and inverse kinematics problems. (06 Marks)
- 3 a. Explain velocity ellipse for a planar 2R manipulator. (10 Marks)
- b. Explain statics serial manipulator with a free body diagram of link. (10 Marks)
- 4 a. Derive the equation of motion of a planer 2R manipulator using Lagrangian formulation. (10 Marks)
- b. Derive the equation of motions of two degree freedom spring-mass damper systems using Lagrangian formulation. (10 Marks)

PART – B

- 5 a. What is trajectory planning? Explain the two common approaches used to plan manipulator trajectory. (10 Marks)
- b. Write a short note on Cartesian straight line motion and Cartesian circular motion. (10 Marks)
- 6 a. Explain PID control of single link manipulator. (10 Marks)
- b. Explain force control of a single mass system. (10 Marks)
- 7 a. With a neat sketch, explain the basic principle of operation and working of a stepper motor. (10 Marks)
- b. Write the comparison of characteristics of hydraulic, electric and pneumatic actuators. (10 Marks)
- 8 a. With a neat sketch explain the basic principle and working of resolver. (10 Marks)
- b. Name different types of proximity sensors and with neat sketch explain any two types of proximity sensors. (10 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2014
Product Life Cycle Management

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Define PLM explain product life cycle model. (06 Marks)
b. Give the need of PLM for today's world. (04 Marks)
c. What are opportunities and benefits of PLM? (05 Marks)
d. What are the components and phases of PLM? (05 Marks)
- 2 a. Explain characteristics of PLM. (07 Marks)
b. Explain the environment driving PLM. (07 Marks)
c. What are elements of PLM? (06 Marks)
- 3 a. PDM is an essential enabler for PLM, justify. (07 Marks)
b. Give reasons for implementing a PDM system. (07 Marks)
c. How to justify the implementation of PDM is profitable. (06 Marks)
- 4 a. Define collaborative product development and explain its elements. (06 Marks)
b. Brief on engineering vaulting and product reuse. (06 Marks)
c. How to achieve engineering change management. (04 Marks)
d. Brief on what is design for environment. (04 Marks)

PART – B

- 5 a. Explain the elements of a typical CAD process on a CAD/CAM system. (07 Marks)
b. Explain with flow chart implementation of typical CAM process on a CAD system. (07 Marks)
c. Brief on how to create 3 D × m CAD drawing using CAD software. (06 Marks)
- 6 a. What are the need for the optimization of design products. (10 Marks)
b. Brief of problems and solution of optimization of product. (10 Marks)
- 7 a. Define digital manufacturing and explain. (06 Marks)
b. Give the benefits of digital manufacturing. (04 Marks)
c. Brief on manufacturing the first one and Ramp up. (05 Marks)
d. Explain product planning in digital manufacturing. (05 Marks)
- 8 Define PLM strategy and explain :
a. What are elements of PLM strategy? (07 Marks)
b. Explain developing a PLM strategy. (07 Marks)
c. Explain the steps assessment for the manufacturing current systems. (06 Marks)