

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Economics

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 factor table is permitted.**

PART – A

- 1
 - a. Explain Law of Return. (06 Marks)
 - b. Deduce an expression for uniform series capital recovery factor, with the necessary cash flow diagram. Firstly derive $F = P(Hi)^n$ and then proceed. (08 Marks)
 - c. Assume that you sold a property today for Rs.242100 and that you had purchased the property 4 years ago with Rs.2,00,000 withdrawn from your saving account. During the 4 year period your savings would have earned 6% compounded quarterly. For a comparison of the investments, calculate the nominal interest rate received from your property purchase. (06 Marks)
- 2
 - a. Explain Pay back comparison method. (04 Marks)
 - b. A newly developed electric car will cost 21000 to purchase. Operating and maintenance costs, including home charging of the batteries, are estimated to be Rs.350 for the first year with annual increase there after of Rs.50 per year. Salvage value after 5 years is estimated to be Rs.6500. A new gasoline runabout will cost Rs.16000 and will average 30 miles per gallon. Gasoline costs Rs.1.26 per gallon is expected to increase at a rate of Rs.0.05 per year each of the next 4 years maintenance costs are estimated to be Rs.300 per year including warranty coverage. Salvage value is estimated to be Rs.1500 after 5 years of service. If the vehicles are expected to be driven for 20,000 miles per year, determine which option will have the lower cost over 5 years. Use present worth analysis with a 10% rate of interest. (10 Marks)
 - c. A small company purchased now for 23000 will lose 1200 each year the first 4 years. An additional 8000 investment in the company during the fourth year will result in a profit 5500 each year from the 5th year through the 15th year. At the end of 15 years. The company can be sold for Rs.33,000 MARR = 12%. (06 Marks)
- 3
 - a. Explain the situations for EAC and EAW comparisons. (04 Marks)
 - b. A city maintenance crew has had experience with a conventional back hoe that suggests that its service life is 6 years. A newly designed machine costs 50% more than the conventional machine but is quieter in operation, which will make it more adoptable to residential neighbor hoods. Both machines will have about the same operating costs, and salvage costs are expected to be negligible. What will be the service life of the new backhoe have to be to make its cost comparable to that of the conventional machine at $i = 10\%$? (08 Marks)
 - c. A sheltered workshop requires a lift truck to handle pallets for a 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. (08 Marks)
- 4
 - a. List and discuss the causes for depreciation. (04 Marks)
 - b. An automobile company is planning to buy a robot for its forging unit. It has identified two different companies for the supply of the robot. The details of cost and incremental revenue of using robots are summarized in the following table :

	Brand	
	Speedex	Giant
Initial cost (Rs.)	5,00,000	9,00,000
Annual incremental revenue (Rs.)	80,000	2,50,000
Life (yrs)	8	8
Salvage value (Rs.)	40,000	60,000

The MARR for the company is 12%. Suggest the best brand of robot to the company based on the ROR method. **(10 Marks)**

- c. A local transport company wants to purchase a Volvo heavy duty truck for 35 lakhs. The company assures that the truck can run 15 lakh kilometers during its 10 years of operation. The salvage value of life period is Rs.8 lakhs. If the truck has already run for this year of operation 10 lakh kilometers, find the depreciation of the truck at this period. **(06 Marks)**

PART – B

- 5 a. Differentiate between estimation and costing. **(04 Marks)**
 b. The expenditure incurred in manufacturing a machine is as follow:

	Amount (Rs.)		Amount (Rs.)
1. Material consumed	5500000	9. Direct wages	650000
2. Indirect factory wages	800000	10. Factory rent	60000
3. Directors fees	300000	11. Telephone and postage charges	15000
4. Advertisement	100000	12. Gas and electricity	50000
5. Net profit	120000	13. Office salaries	210000
6. Depreciation on sales department car	11000	14. Office rent	50000
7. Printing and stationary	2500	15. Showroom rent	150000
8. Depreciation of plant	45000	16. Salesman's commission	26500
		17. Sales departments car expenses	15000

Determine: i) Direct cost; ii) Factory cost; iii) Total cost of production; iv) Cost of sales; v) Selling price. **(09 Marks)**

- c. The catalogue price of a washing machine is Rs.9000 and the commission allowed to the proprietor of the showroom is 20%. The administrative and the selling expenses are 60% of the factory cost and material cost, labour cost and factory overheads are in the ratio of 2:3:1. If the cost of the labour on the manufacture of machine is Rs.1650, determine the profit on each washing machine. **(07 Marks)**
- 6 a. Differentiate between debentures and shares. **(04 Marks)**
 b. The following is the trial balance of Mr. Ratan associates for the year ending 31st March 2014, prepare trading accounts profit and loss account and balance sheet: **(16 Marks)**

Particulars	Dr	Cr
Sales		215000
Purchase	135500	
Sales return	3000	
Purchase return		2000
Sundry debtors	30,500	
Sundry creditors		20,600
Opening stock	20400	
Salaries and wages	27,500	
Furniture	6600	
Repairs to shop	3200	
Postage and telegrams	2800	
Power and electricity	500	
Trade expenses	1200	
Rent and taxes	4800	
Bad debts	750	
Fixed deposit in bank	13500	
Interest on deposit		750
Insurance	600	
Pre-paid insurance	200	
Cash in hand	550	
Bank balance	2300	
Outstanding salaries		2200
Depreciation on furniture	1000	
Drawings	4000	
Capital		18350
	258900	258900

Closing stock was valued at Rs.19500.

- 7 a. Make an assessment of comparative position of the firms A, B and C after taking the following data. Calculate the relevant ratio and comment on it: (10 Marks)

Particulars	Firm A	Firm B	Firm C
Avg inventory	10,00,000	15,00,000	20,00,000
Sales	66,00,000	83,59,000	89,60,000
Cost of goods sold	60,00,000	75,00,000	80,00,000
Expenses of managements	5,00,000	7,60,000	10,00,000
Receivables	13,20,000	24,97,500	35,84,000

- b. Briefly explain the following ratios:
i) Leverage ratio; ii) Activity ratio; iii) Profitability ratios. (10 Marks)
- 8 a. Briefly explain Bench marking of manufacturing operation. (05 Marks)
- b. A manufacturing company has a production capacity of 20,000 units of product A. The expenses for the production of 10,000 units for a period is as follows:

Particulars	Cost/unit Rs.
Materials	40
Wages	10
VOH	10
Manufacturing expenses (40% fixed)	10
Administrative (all fixed)	5
Selling and distribution expenses (50% fixed)	5
Profit	20
Selling	100

Prepare a flexible budget to show 70 and 100% level of activity. It is expected that the present unit selling price will remain constant up to 60% beyond which 5% reduction is contemplated up to 100% level of activity. Also give your opinion an which level of activity should be selected. (15 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015
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. Explain phenomena beats. (05 Marks)
 b. Derive an equation for work done by harmonic force. (05 Marks)
 c. Represent the periodic motion given in the Fig.Q.1(c) by harmonic series. (10 Marks)

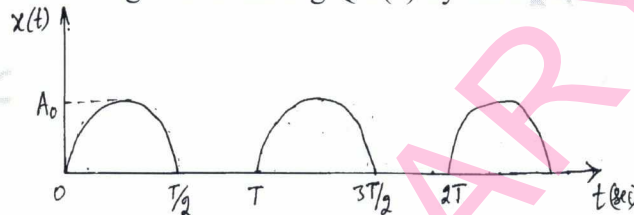


Fig.Q.1(c)

- 2 a. Determine the natural frequency of the system shown in the Fig.Q.2(a) by Newton's method and energy method. (10 Marks)

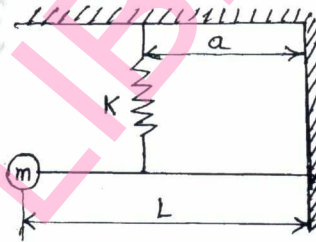


Fig.Q.2(a)

- b. Determine the natural frequency of the system shown in the Fig.Q.2(b) by Newton's method and Energy method. (10 Marks)

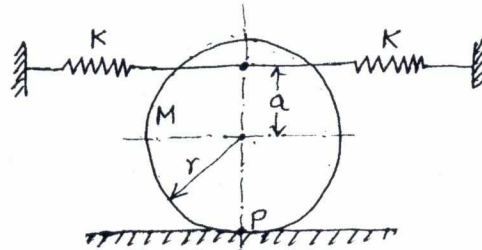


Fig.Q.2(b)

- 3 a. Set up the differential equation for a spring mass damper system and obtain complete solution for the critically damped condition. (10 Marks)
 b. Determine: i) Critical damping coefficient; ii) Damping factor; iii) Natural frequency of damped vibrations; iv) Logarithmic decrement; v) Ratio of two consecutive amplitudes of vibrating system which consists of mass of 25kg, a spring of stiffness 15kN/m and a damper. The damping provided is only 15% of the critical value. (10 Marks)

- 4 a. Define transmissibility and derive an expression for the transmissibility ratio and the phase angle for transmitted force. (10 Marks)
- b. A machine of mass one 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. (10 Marks)

PART – B

- 5 a. Explain Frahm's reed tachometer. (05 Marks)
- b. Explain vibrometer. (05 Marks)
- c. The rotor of a turbo-super charger weighing 88.3N is keyed to the centre of a 25mm diameter shaft 40cm between the bearings. Determine: i) the critical speed of shaft; ii) The amplitude of vibration of the rotor at a speed of 3200 rpm of the eccentricity is 0.015mm and iii) Vibratory force transmitted to the bearings at this speed. Assume the shaft to be simply supported and the shaft material has a density of 8gm/cm^3 . Take $E = 2.06 \times 10^5 \text{ MPa}$. (10 Marks)
- 6 a. Explain the working principle of dynamic absorber. (08 Marks)
- b. Determine the natural frequencies of the spring mass pulley system as shown in the Fig.Q.6(b). The cord is inextensible and there is no slippage between the cord and the pulley. Take $K_1 = 40\text{N/m}$, $K_2 = 60\text{N/m}$, $m = 2\text{kg}$ and $M = 10\text{kg}$. (12 Marks)

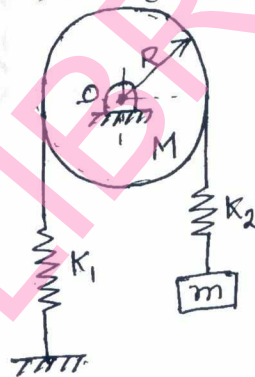


Fig.Q.6(b)

- 7 Determine the natural frequency of the system shown in the Fig.Q.7 by Holzer's method. (20 Marks)

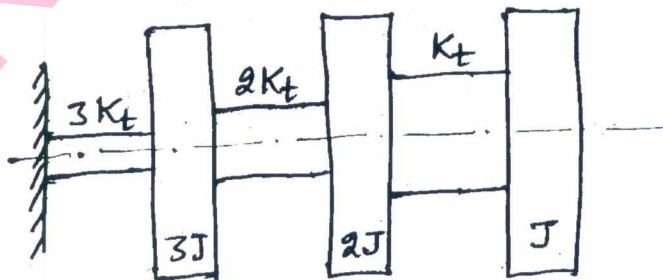


Fig.Q.7

- 8 a. Explain the experimental modal analysis and the necessary basic equipments. (10 Marks)
- b. Explain machine condition monitoring techniques. (10 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

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. State Pascal's law. Explain with neat sketch, the basic hydraulic power system. (06 Marks)
 - b. Explain the construction and working of Balanced Vane Pump. (08 Marks)
 - c. A Vane has a rotor of diameter 50 mm, a cam ring of diameter 80 mm and the vane of width 40 mm. Compute the volumetric displacement if the eccentricity is 10 mm. (06 Marks)
- 2
 - a. With sketch briefly explain linear hydraulic actuators. (06 Marks)
 - b. Explain with neat sketch the operation of Swash Plate Piston motor in hydraulic system. (05 Marks)
 - c. A hydraulic motor has a volumetric displacement of 123 cm³ operating at a pressure of 60 bar and speed 1800 rpm. If the actual flow rate consumed by the motor is 0.004 m³/sec and the actual torque delivered by the motor is 100 Nm. Find: i) Volumetric efficiency, ii) Mechanical efficiency, iii) Overall efficiency. (09 Marks)
- 3
 - a. Explain with a neat sketch the working of four way, two position directional control valve with symbolic representation. (06 Marks)
 - b. Explain with a neat sketch construction and operation of simple pressure relief valve. (07 Marks)
 - c. Explain briefly with neat sketch working of pressure compensated flow control valve. (07 Marks)
- 4
 - a. Explain with a neat circuit diagram the working of a regenerative circuit. (08 Marks)
 - b. Explain with a neat circuit working of a sequencing circuit in a drilling machine. (08 Marks)
 - c. What are hydraulic accumulators? Classify the accumulators used in hydraulic system. (04 Marks)

PART – B

- 5
 - a. Explain any five desirable properties of a hydraulic fluid. (10 Marks)
 - b. What are the functions of reservoir system? Explain briefly with neat sketch construction of reservoir system. (10 Marks)
- 6
 - a. Explain the characteristics of compressed air. (06 Marks)
 - b. Define pneumatic system. Give the difference between hydraulic and pneumatic system. (06 Marks)
 - c. Explain end position cushioning in pneumatic cylinder with diagram. (08 Marks)
- 7
 - a. Explain with a neat sketch control of extension of a double acting cylinder using logic gates. (10 Marks)
 - b. Explain with a neat sketch construction and operation of a typical quick exhaust valve to increase the actuation speed of a cylinder in a pneumatic system. (10 Marks)
- 8
 - a. Explain with a neat diagram coordinated sequence motion of two cylinders. (10 Marks)
 - b. Write a short note on air dryer and air filter. (10 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

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. Define operations research. Explain the phases of operations research. (06 Marks)
- b. A firm manufactures two products A and B on which the profit earned per unit are ` 3 and ` 4 respectively. Each product is processed on two machines M_1 and M_2 . Product A requires one minute of processing time on M_1 and two minutes on M_2 while B requires one minute on M_1 and one minute on M_2 . Machine M_1 is available for not more than 7 hrs. 30 mins while machine M_2 is available for 10 hrs during any working day. Find the number of units of product A and B to be manufactured to get maximum profit. (14 Marks)
- 2** a. Solve the following LPP using simplex method:
 Maximize $Z = 3x_1 + 2x_2$
 Subject to constraints $x_1 + x_2 \leq 4$
 $x_1 - x_2 \leq 2$
 $x_1, x_2 \geq 0$ (10 Marks)
- b. Solve the given problem by using Big-M method:
 Maximize $Z = -2x_1 - x_2$
 Subject to constraints $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 4$ and
 $x_1, x_2 \geq 0$. (10 Marks)
- 3** a. ABC limited has three production shops supplying a product to 5 warehouses. The cost of production varies from shop to shop, cost of transportation from shop to shop, cost of transportation from shop to warehouses also varies. Each shop has a specific production capacity of each warehouse has certain amount of requirement. The cost of transportation are as given below:

Shop	Warehouse					Capacity	Cost for production
	I	II	III	IV	V		
A	6	4	4	7	5	100	14
B	5	6	7	4	8	125	16
C	3	4	6	3	4	175	15
Requirement	60	80	85	105	70		

Find the optimum quantity to be supplied from each shop to different warehouse at minimum cost. (12 Marks)

- b. A ABC company has 5 tasks and 5 persons to perform. Determine the optimal assignment that minimizes the total cost.

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

(08 Marks)

- 4 a. Explain the importance of integer programming. (05 Marks)
- b. Solve the following linear programming by Gomory technique:

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

$$\text{Subject to } 2x_1 + x_2 \leq 6$$

$$4x_1 + 5x_2 \leq 20$$

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

(15 Marks)

PART – B

- 5 a. Define the following: (06 Marks)
- Normal time
 - Crash time
 - Free float
- b. R and D activity has 7 activities for which the three time estimates are given below along with its preceding activity.

Activity	Preceding activity	Optimistic time (a)	Most likely time (m)	Pessimistic time (b)
A	-	4	6	8
B	A	6	10	12
C	A	8	18	24
D	B	9	9	9
E	C	10	14	18
F	A	5	5	5
G	D, E, F	8	10	12

- Draw PERT network.
 - Find EST, LST and slack for each node.
 - Find critical path and expected project duration. (14 Marks)
- 6 a. Briefly explain queuing system and its characteristics. (06 Marks)
- b. Arrival rate of telephone call at a telephone booth are according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes.
- Determine the probability that a person arriving at the booth will have to wait.
 - Find the average queue length.
 - The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth.
 - What is the probability that he will have to wait for more than 10 minutes before the phone is free? (14 Marks)

7 a. Explain clearly the following terms:

- i) Pay off matrix
- ii) Saddle point
- iii) Fair game

(06 Marks)

b. Use dominance rule to find the optimum strategies for both the player.

	B_1	B_2	B_3	B_4	B_5	B_6
A_1	4	2	0	2	1	1
A_2	4	3	1	3	2	2
A_3	4	3	7	-5	1	2
A_4	4	3	4	-1	2	2
A_5	4	3	3	-2	2	2

(07 Marks)

c. Solve the game by graphical method:

	b_1	b_2
a_1	1	-3
a_2	3	5
a_3	-1	6
a_4	4	1

(07 Marks)

8 a. Define: (i) Total elapsed time, (ii) Idle time.

(04 Marks)

b. List the assumption made while dealing with sequencing problem.

(04 Marks)

c. We have five jobs each of which must go through the machines A, B and C in the order ABC. Determine a sequence for job that will minimize the total elapsed time and idle time for each machine.

Job number	Processing time in hours				
	1	2	3	4	5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

(12 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

Nonconventional Energy Sources

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Discuss with the help of recent statistics on India's production of electricity from commercial and non-commercial sources of energy. (10 Marks)
- b. Write short notes on oil shale and Tarsands. (06 Marks)
- c. Compare the renewable sources of energy based on quantitative approach. (04 Marks)

- 2 a. Define the following terms:
 - i) Extra-terrestrial radiation
 - ii) Langley's and
 - iii) Global radiation (06 Marks)
- b. Explain the working principle of pyranometer with sketch. (10 Marks)
- c. Determine the local apparent time corresponding to 12.00 noon Indian standard time longitude $81^{\circ}44'E$ on May 8th, 1995 for Delhi. Assume equation of time is 8 minutes and 31 seconds. (04 Marks)

- 3 a. List out the different concentrating solar collector and explain the working principle with schematic diagram of any two concentrating collector. (12 Marks)
- b. Calculate the monthly average hourly radiation falling on a flat plate collector facing south ($\gamma = 0^{\circ}$) with the slope of 10° . Given the following data:

Location : Trivandrum ($8^{\circ}29'N$)
 Month : October
 Time : 1300 – 1400 hours
 I_g : 2508 kJ/m²-h
 I_d : 1073 kJ/m²-h
 Assume ground reflectivity to be 0.23. (08 Marks)

- 4 a. Explain with neat sketch about the description and the working principle of liquid flat plate collector. (10 Marks)
- b. Define the following term:
 - i) Stagnation temperature of absorber plate
 - ii) Instantaneous efficiency
 - iii) Selective surface
 - iv) Collector heat removal factor
 - v) Transmissivity of the glass cover (10 Marks)

PART – B

- 5 a. Explain the description of solar photovoltaic cell and list out the various factors to limiting the efficiency of photovoltaic cell. (10 Marks)
- b. List out the various types of wind turbine and explain any one type of vertical axis wind turbine with neat sketch. (10 Marks)

- 6 a. With neat sketch, explain the working principle of oscillating water column wave power device. (10 Marks)
- b. Discuss in details about the choice of working fluid in OTEC power plant. (05 Marks)
- c. List out the geothermal power plant in the world. (05 Marks)
- 7 a. Describe the construction and working principle of bio-gas plants with simple sketch. (10 Marks)
- b. List out the problems involved with biogas production. (05 Marks)
- c. Discuss the application of bio-gas in internal combustion engines. (05 Marks)
- 8 a. What are the various routes of hydrogen production? Explain the hydrogen production through electrolysis of water with simple sketch. (10 Marks)
- b. Discuss in detail about the metal hydride hydrogen storage. (10 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

Product Lifecycle 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 PLCM and explain. (04 Marks)
b. Explain PLM lifecycle model with a neat sketch. (08 Marks)
c. Explain different threads of PLCM. (08 Marks)
- 2 a. Explain the different phases of PLCM with a neat sketch. (08 Marks)
b. Explain any four external drivers of PLCM. (08 Marks)
c. Explain any two internal drivers of PLCM. (04 Marks)
- 3 a. Define PDM systems. Explain the importance and reasons for implementing them in organizations. (10 Marks)
b. Explain the following: (i) Check in and check out, (ii) Met data (10 Marks)
- 4 a. What is collaborative product development? Briefly explain. (04 Marks)
b. Briefly explain the following:
i) Start and smart parts
ii) Bill of material and process consistency
iii) Digital Mock-up and prototype development
iv) Design for environment (16 Marks)

PART – B

- 5 a. Explain the process of creation of 3DXML and CAD drawing using CAD software. (10 Marks)
b. How an acrobat 3D document is created? Explain the different steps involved in it. (10 Marks)
- 6 a. Explain the process of parameterization of design in brief. (08 Marks)
b. Explain the following:
i) Publication ii) Parameters
iii) Design table iv) Configuration (12 Marks)
- 7 a. What is digital manufacturing? Explain. (04 Marks)
b. Briefly explain the following:
i) Manufacturing the first one ii) The virtual learning curve
iii) Manufacturing the rest iv) Production planning (16 Marks)
- 8 a. What is a PLM strategy? Explain in brief. (04 Marks)
b. Explain impact of strategy with a graph. (08 Marks)
c. How PLM strategy is implemented? Mention five success factors for ERP projects. (08 Marks)

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