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10ME71

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Economy

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.**
2. Missing data to be assumed suitably.
3. Use of interest factor table is permitted.

PART – A

1.
 - a. Discuss the interest rate from borrower's and lenders point of view with cash flow diagram. **(05 Marks)**
 - b. Explain law of demand and supply with suitable example. **(05 Marks)**
 - c. Determine the effective interest rate for a nominal annual rate of 6 percent that is compounded : (i) Semiannually (ii) Quarterly (iii) Monthly (iv) Daily **(06 Marks)**
 - d. Deduce the expression for sinking fund factor (uniform series). **(04 Marks)**
2.
 - a. What do you understand by present worth by the "72 Rule"? **(02 Marks)**
 - b. Machine A has the first cost of ₹ 9000, no salvage value at the end of its 6-years useful life and annual operating cost of ₹ 5000. Machine B costs ₹ 16000 new and has an expected resale value of ₹ 4000 at the end of its 9 year economic life. Operating cost for machine B are ₹ 4000 per year. Compare the two alternatives on the basis of their present worths, using the repeated projects assumption at 10 percent annual interest. **(08 Marks)**
 - c. A wealthy industrial economist dies and her will specifies that ₹ 5 million of her estate will go to xyz university to fund a small engineering economy building as well as 20 graduate scholarships per year over the next 20 years. The scholarships are to have a value of ₹ 12000 per year for the first year and should increase at a rate ₹ 1500 per year over the following 19 years. xyz university requires that ₹ 15000, starting with the third year of the bequest, be reserved for building maintenance and operating costs. These costs are to have a linear increase of ₹ 2000 per year, starting with year 4. Assuming that a 10 percent interest rate is used for such analysis, determine how much will be available for building first costs. **(10 Marks)**
3.
 - a. What is annuity contract for a guaranteed income? Explain. **(04 Marks)**
 - b. What is the uniform series value "A" of the following cash flow with non equal interest rates shown below: **(08 Marks)**

End of year	0	1	2	3	4	5
Interest rate %	7	7	9	10	5	
Receipts in Rs.	10,000		10,000		10,000	
Payments in Rs.		3,000		6,000		11,000

- c. Two types of power converters, alpha and beta are under consideration for a specific application. An economic comparison is to be made at an interest rate of 10 percent and the following cost estimates have been obtained:

	Alpha	Beta
Purchase price	₹ 10,000	₹ 25,000
Estimated service life	5 years	9 years
Salvage value	0	₹ 5000
Annual operating cost	₹ 2500	₹ 1200

Determine the annual equivalent costs of the alternative systems.

(08 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.

- 4 a. Explain MARR, IRR. (03 Marks)
 b. A ₹ 1000 utility bond with 14 years remaining before maturity can be now purchased for ₹ 760. It pays interest of ₹ 20 each 6 month period. What rate of return is earned by purchasing the bond at the current market plus a brokerage charge of ₹ 20? (08 Marks)
 c. Explain the causes of depreciation with example. (09 Marks)

PART – B

- 5 a. Explain : (i) Prime cost (ii) First cost (iii) Sunk cost (iv) Life cycle cost (06 Marks)
 b. A small firm is producing 1000 pens per day. The cost of direct material is ₹ 1600 and that of direct labour is ₹ 2000. Factory overheads chargeable to it are ₹ 2500. If the selling on cost is 40% of the factory cost, what must be the selling price of each pen to realize a profit of 20 percent of the selling price? (07 Marks)
 c. The market price of a drilling machine is ₹ 50000 and the discount allowed to the distributors is 20 percent of the market price. The selling expenses cost is $\frac{1}{4}$ th of the factory cost. If the material cost, labour cost and factory overheads charges are in the of 1 : 4 : 2, what profit is made by the factory on each drilling machine, if the material cost is ₹ 4000? Other overheads may be neglected. (07 Marks)
- 6 a. Explain the relation between balance sheet and profit and loss account. (04 Marks)
 b. The company xyz having certain reserves and surplus has the following details on 31st March, 2013.

Dividend payable – ₹ 72000	Debtors – ₹ 1,60,000
Bank balance – ₹ 10000	Bills payable – ₹ 20,000
Equity share – ₹ 200000	Plant and equipment - ₹ 80000
Provision for tax – ₹ 40000	Bills receivable – ₹ 20000
Stock – ₹ 77,000	Creditors – ₹ 55,000
8% preferred share – ₹ 1,35,000	General reserve – ₹ 40000
Land and building – ₹ 2,00,000	Cash in hand – ₹ 15000

- Prepare balance sheet as on 31st March, 2013. (10 Marks)
 c. Explain the system of book keeping, journal and ledger. (06 Marks)
- 7 a. Explain in detail types of financial ratio analysis. (10 Marks)
 b. The company has an inventory of ₹ 180000 debtors of ₹ 115000 and an inventory turnover of 6. The gross profit margin of the company is 10 percent and its credit sales are 20 percent of the total sales. Calculate the average collection period. (Assume a 360 day year). (05 Marks)
 c. A company has a net profit after taxes ₹ 120000 and pays a cash dividend of ₹ 48000 on it 36000 shares outstanding at a time when the share is selling for ₹ 12. What is the yield and the dividend payout? (05 Marks)
- 8 a. Briefly explain the objectives of profit planning. (05 Marks)
 b. Explain essential of successful of budgeting. (05 Marks)
 c. Prepare a purchase budget in quantity and rupees from the following particulars when the estimated price / kg is A – ₹ 3, B – ₹ 4, C – ₹ 5, D – ₹ 6. (10 Marks)

Material	Estimated consumption of material in kgs
A	150000
B	175000
C	75000
D	300000

Material	Stock at the beginning	Stock at the end estimated
A	40000	20000
B	50000	25000
C	20000	5000
D	60000	50000

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Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017

Mechanical Vibrations

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Missing data may be suitably assumed.**

PART - A

- 1 a. Add the following harmonic motions analytically and check the solution graphically:
 $x_1 = 4 \cos(\omega t + 10^\circ)$, $x_2 = 6 \sin(\omega t + 60^\circ)$. (10 Marks)
- b. Represent the periodic motion given in the Fig.Q.1(b) by harmonic series. (10 Marks)

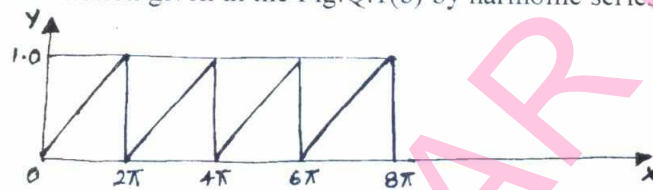


Fig.Q.1(b)

- 2 a. Determine the natural frequency of spring-mass system taking the mass of the spring in to account. (10 Marks)
- b. Using energy method find the natural frequency of the system shown in the Fig.Q.2(b). (10 Marks)

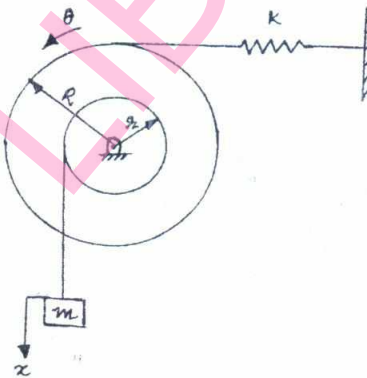


Fig.Q.2(b)

- 3 a. Obtain the response of viscous damped system for critically damped case. (10 Marks)
- b. The disc of a torsional pendulum has a moment of inertia of 0.06 kg m^2 and is immersed in a viscous fluid. The brass shaft attached to it is of 100mm diameter and 400mm long when the pendulum is vibrating. The observed amplitude on the same side of neutral position for the successive cycles are 9° , 6° and 4° . Determine:
- Logarithmic decrement.
 - Damping torque at unit velocity.
 - Periodic time of vibration.
 - The frequency if the pendulum is removed from the viscous fluid.
- Assume for brass shaft $G = 4.4 \times 10^{10} \text{ N/m}^2$. (10 Marks)

- 4 a. Show that for a spring mass damped system the peak amplitude occurs at a frequency ratio given by the expression $\frac{\omega}{\omega_n} = \sqrt{1 - 2\xi^2}$, when the system is excited by a harmonic force. Also determine the expressions for peak amplitude and the corresponding phase angle. (10 Marks)
- b. A machine of mass one tonne is acted upon by an external force of 2450N at a frequency of 1500 rpm. 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:
- Force transmitted to the foundation.
 - Amplitude of vibration of the machine.
 - 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. A horizontal shaft of 25mm diameter carries a mass of 12kg mounted midway. The shaft is supported at the ends by two bearings. The span between the bearings is 900mm. The mass centre is 0.02mm from the axis of the shaft. Determine the amplitude of steady state vibrations and the dynamic force on the bearings when the shaft rotates at 3000 rpm. Take $E = 200\text{GPa}$. Neglect damping and mass of shaft. (10 Marks)
- 6 a. What is a "Semi definite system"? Explain. (08 Marks)
- b. Determine the natural frequencies of the system as shown in the Fig.Q.6(b) if $k_1 = 4 \times 10^3 \text{ N/m}$, $k_2 = 50 \times 10^3 \text{ N/m}$, $k_3 = 60 \times 10^3 \text{ N/m}$, $m_1 = 10\text{kg}$, $m_2 = 12\text{kg}$, $r_1 = 0.10\text{m}$ and $r_2 = 0.11\text{m}$. (12 Marks)

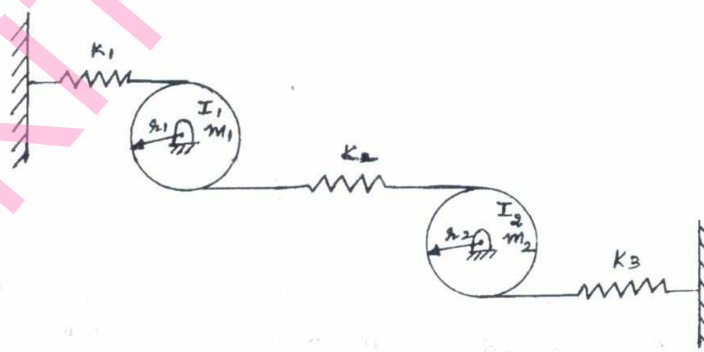


Fig.Q.6(b)

- 7 a. Using Stodala's method find the natural frequencies of the four mass system as shown in Fig.Q.7(a) if $k = 1 \text{ N/m}$ and $m = 1 \text{ kg}$. (15 Marks)

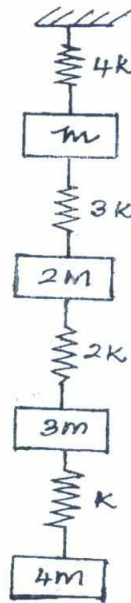


Fig.Q.7(a)

- b. Use Dunkerley method to find the fundamental natural frequency of transverse vibration for the system shown in Fig.Q.7(b). (05 Marks)

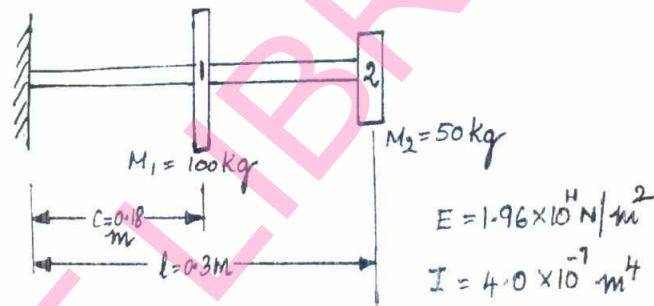


Fig.Q.7(b)

- 8 a. Briefly explain the hardware of an equipment necessary for experimental modal analysis. (10 Marks)
 b. Explain machine condition monitoring techniques. (10 Marks)

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10ME73

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Hydraulics and Pneumatics

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1
 - a. State Pascal's law. Explain its applications, with a neat sketch. (04 Marks)
 - b. Explain the working of unbalanced vane pump. Also obtain an expression for its theoretical discharge. (10 Marks)
 - c. A pump having a displacement of 25cm^3 , operates with a pressure of 250 bar and speed of 1390 rpm. Volumetric efficiency of 0.85 and mechanical efficiency of 0.80. Calculate
 - i) Pump delivery in LPM
 - ii) Input power at pump shaft in KW
 - iii) Drive Torque at pump shaft. (06 Marks)
- 2
 - a. With a neat sketches, explain First, Second and Third class lever system. (06 Marks)
 - b. An 8 cm diameter hydraulic cylinder has 4cm diameter rod. If the cylinder receives the flow at 100 LPM and 12MPa. Find
 - i) Extension and Retraction speeds
 - ii) Extension and Retraction load carrying capacities. (04 Marks)
 - c. Explain with a neat sketch :
 - i) Balanced vane motor
 - ii) Swash plate piston motor. (10 Marks)
- 3
 - a. Explain the working principle of pilot operated check valve with a neat sketch. Illustrate the graphical symbol of the valve (10 Marks)
 - b. Explain with the aid of sketches :
 - i) Non – compensated flow control valve
 - ii) Compensated flow control valve. (10 Marks)
- 4
 - a. Explain the following :
 - i) Meter In and Meter Out circuit
 - ii) Classification of accumulator and explain any 2 types. (10 Marks)
 - b. With a neat sketch, explain Hydraulic circuit for sequencing of Two cylinders. (10 Marks)

PART – B

- 5
 - a. How are hydraulic seals classified? Explain positive and non positive seals. (06 Marks)
 - b. With the aid of sketches, explain the following :
 - i) Return line filtering
 - ii) Suction line filtering
 - iii) Pressure line filtering. (06 Marks)
 - c. Sketch and explain the "Reservoir System". (08 Marks)
- 6
 - a. Differentiate between Hydraulic and Pneumatic systems. (05 Marks)
 - b. Sketch and explain the cushion assembly for a pneumatic cylinder. (07 Marks)
 - c. Write short notes on :
 - i) Cylinder mounting arrangement
 - ii) Rod less cylinder. (08 Marks)
- 7
 - a. Explain with a suitable circuit diagram :
 - i) Shuttle valve
 - ii) Quick exhaust valve. (10 Marks)
 - b. Briefly explain the following :
 - i) OR gate
 - ii) AND gate. (10 Marks)
- 8 Write short notes on :
 - a. Solenoids.
 - b. Air Driers.
 - c. Air filters.
 - d. Motion Diagrams. (20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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10ME74

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Operations Research

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Briefly explain the scopes of Operation Research. (05 Marks)
- b. A farmer has 100 acre farm. He can sell all tomatoes, lettuce or radishes and can rise the price to obtain Rs 1.00 per kg for tomatoes, Rs 0.75 a head for lettuce and Rs 2.00 per kg for radishes. The average yield per acre is 2000 kgs of tomatoes, 3000 heads of lettuce and 1000 kgs of radishes. Fertilizers are available at Rs 0.50 per kg and the amount required per acre is 100 kgs each for tomatoes and lettuce and 50 kgs for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man days for tomatoes and radishes and 6 man days for lettuce. A total of 400 man days of labour are available at Rs 20 per man day. Formulate this problem as a linear programming model to maximize the farmer's total profit. (15 Marks)
- 2 a. Write the dual of the following LPP.
 Minimize $Z = 3x_1 - 6x_2 + 4x_3$
 Subject to $4x_1 + 3x_2 + 6x_3 \geq 9$
 $1x_1 + 2x_2 + 3x_3 \geq 6$
 $6x_1 - 2x_2 - 2x_3 \leq 10$
 $x_1 - 2x_2 + 6x_3 \geq 4$
 $2x_1 + 5x_2 - 3x_3 \geq 6$
 $x_1, x_2, x_3 \geq 0$. (05 Marks)
- b. Solve the following Linear Programming problem.
 Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$
 Subject to $x_1 + 2x_2 + 3x_3 = 15$
 $2x_1 + x_2 + 5x_3 = 20$
 $x_1 + 2x_2 + x_3 + x_4 = 10$
 $x_1, x_2, x_3, x_4 \geq 0$.
 Solve by using Two phase method. (15 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 of 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. (08 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. Explain the importance of integer programming. (05 Marks)
 b. Solve the following linear programming by Gomory technique :
 Maximize $Z = x_1 + x_2$
 Subject to $2x_1 + x_2 \leq 6$
 $4x_1 + 5x_2 \leq 20$
 $x_1, x_2 \geq 0$ and integers. (15 Marks)

PART - B

- 5 a. Define the following terms with reference to PERT :
 i) Total float ii) Free float iii) Independent float. (06 Marks)
 b. A project schedule has the following characteristics.

Activity	Time (weeks)	Activity	Time (weeks)
1 - 2	4	5 - 6	4
1 - 3	1	5 - 7	8
2 - 4	1	6 - 8	1
3 - 4	1	7 - 8	2
3 - 5	6	8 - 10	5
4 - 9	5	9 - 10	7

- i) Draw the network and find the critical path.
 ii) Compute EST, EFT, LST, LFT, total float for each activity. (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.
 i) Determine the probability that a person arriving at the booth will have to wait.
 ii) Find the average queue length.
 iii) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least 4 minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth.
 iv) What is the probability that he will have to wait for more than 10 minutes before the phone is free? (14 Marks)
- 7 a. Solve the following game by Graphical method. (14 Marks)

		B				
		1	2	3	4	5
A	1	3	0	6	-1	7
	2	-1	5	-2	2	1
		2 of 3				

- b. Use Dominance Rule to find the optimum strategies for both the player.

(06 Marks)

	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

- 8 a. Define i) Total elapsed time ii) Idle time. (04 Marks)
 b. Find the sequence that minimized the total time required in performing the job on 3 machines in the order CBA. (16 Marks)

	Machine		
Job	A	B	C
1	8	3	8
2	7	4	3
3	6	5	7
4	9	2	2
5	10	1	5
6	9	6	1

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10ME754

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Non-Conventional Energy Sources

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Missing data may be suitably assumed.**

PART – A

- 1 a. Elaborate on India's production and reserves of commercial energy sources. (10 Marks)
b. Enlist the merits and demerits of any three non-conventional energy sources. (10 Marks)
- 2 a. With schematic representation, explain the mechanism of absorption, scattering, beam and diffuse radiation received at earth surface. (06 Marks)
b. What are the various instruments used for solar radiation measurement? Explain pyranometer with neat sketch. (08 Marks)
c. Define : (i) Zenith angle (ii) Solar altitude angle (iii) Surface azimuth angle. (06 Marks)
- 3 a. Explain beam radiation and diffuse radiation. Also write the expression for tilt factor for the above two. (06 Marks)
b. List the different types of concentrating collectors. Explain any one of them with a neat sketch. (07 Marks)
c. With a neat sketch explain the working principle of solar pond. (07 Marks)
- 4 a. Explain the heat transfer process in LFPC with neat sketch and also write energy balance equation, explaining each term in it. (08 Marks)
b. List and discuss the various parameters that affect the performance of the collector. (12 Marks)

PART – B

- 5 a. Explain the working principle and characteristics of photovoltaic conversion. (08 Marks)
b. Wind blow with a velocity of 15 m/s at 15°C and 1 std atm. pressure. The turbine diameter is 120 m with operating speed 40 rpm at maximum efficiency. Propeller type wind turbine is considered. Calculate the following :
(i) Total power density in the wind stream (ii) The maximum obtainable power density
(iii) A reasonably obtainable power density (iv) Total power
(v) Torque at maximum efficiency (vi) Maximum axial thrust.
Assume $R = 0.287 \text{ kJ/kg K}$, $\eta = 35\%$. (12 Marks)
- 6 a. Explain briefly the harnessing of Tidal Energy. (06 Marks)
b. Explain with a sketch, the closed Rankine cycle OTEC system. (08 Marks)
c. Give a brief note on prospects of geothermal energy in context to India. (06 Marks)
- 7 a. Explain the constructional details and working of KVIC digester. (10 Marks)
b. Explain the following : (i) Photo synthesis (ii) Energy plantation. (10 Marks)
- 8 a. What are the different methods of hydrogen production? Describe the more popular method of hydrogen production. (10 Marks)
b. Explain briefly the methods of hydrogen storage and transportation. (10 Marks)

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10ME769

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017

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 PLCM and explain. (04 Marks)
b. Explain any five benefits of PLM. (10 Marks)
c. With a neat sketch, explain the stages of PLM. (06 Marks)
- 2 a. Explain any five characteristics of PLM. (10 Marks)
b. Explain the following drivers of PLM with example: i) Scale; ii) Complexity; iii) Productivity; iv) Quality. (10 Marks)
- 3 a. Explain financial justification of PDM implementation. (08 Marks)
b. Explain the following: i) Versioning; ii) Lifecycle; iii) Workflow. (12 Marks)
- 4 a. What is collaborative product development? Briefly explain. (05 Marks)
b. Explain the following:
i) Product reuse
ii) Engineering change management
iii) Marketing collateral. (15 Marks)

PART – B

- 5 a. Explain the process of creation of 3D XML 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) Power copy; ii) Formula; iii) Rule; iv) Check. (12 Marks)
- 7 a. What is digital manufacturing? Explain. (10 Marks)
b. Briefly explain the following:
i) Manufacturing the first one.
ii) The virtual learning curve.
iii) Manufacturing the rest.
iv) Production planning. (10 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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