MAHATMAGANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech.V Semester End Examinations
(Electrical and Electronics Engineering)
(Model Question Paper)

MR-22

Subject Title: Power Electronics **Subject Code: EE501PC**
Time: 3hours Max.Marks:60

Note: Answer ALL Questions
Part-A(10x1=10Marks)

Q. No.	Stem of the question	M	L	CO	PO
	Unit-I				
1. a)	Define Latching Current	1	2	1	1,2
1. b)	Define Thyristor turn-off time.	1	2	1	1,2
	Unit-II				
1. c)	What are the applications of AC Voltage Controllers?	1	2	2	1,2
1. d)	Which commutation is used in step-up cycloconverter? Justify.	1	2	2	1,2
	Unit-III				
1. e)	What are the applications of fully controlled converters.	1	2	3	1,2
1. f)	What is a Dual converter?	1	2	3	1,2
	Unit-IV				
1. g)	What is Current Limit Control?	1	2	4	1,2
1. h)	What is a Boost Chopper?	1	2	4	1,2
	Unit-V				
1. i)	What are the advantages of PWM control?	1	2	5	1,2
1. j)	What is an Inverter?	1	2	5	1,2

Part-B(5 x10=50 Marks)

Q. No.	Stem of the question	M	L	CO	PO
	Unit-I				
2. a)	Explain the construction and working of Power MOSFET.	5	2	1	1,2
2. b)	Compare Power MOSFET and Power BJT. List out the applications of Power MOSFET.	5	2	1	1,2
	OR				
2. c)	Explain the two transistor analogy of SCR.	5	2	1	1,2
2. d)	Explain the static V-I characteristics of SCR.	5	2	1	1,2
	Unit-II				
3. a)	Explain the operation of single phase AC voltage controller with RL-Load and derive the expression for rms voltage.	5	4	2	1,2
3. b)	A single phase full wave AC voltage controller operated from 110V, 60Hz mains supplies an RL load having R = 5Ω and L = 25mH. The firing angle of thyristors is 60˚. Determine the output voltage and current.	5	4	2	1,2,3
	OR				
3. c)	Describe the basic principle of working of a single phase Bridge type step down cycloconverter. Which commutation is used for it?	5	2	2	1,2
3. d)	Explain the operation of single phase half wave AC Voltage Controller. What are its disadvantages?	5	2	2	1,2
	Unit-III				
4. a)	Explain the operation of single phase fully controlled converter with RL load. Derive the expression for average output voltage.	5	3	3	1,2
4. b)	A single phase half controlled converter is connected to 230V, 50Hz supply. The load current can be assumed continuous and ripple free and is 4A. If the firing angle is 45˚. Calculate load impedance and load voltage.	5	3	3	1,2,3

P.T.O.

OR					
4. c)	Explain with neat waveforms, the operation of three phase half wave controlled converter with RL load. Derive the expression for average output voltage.	5	4	3	1,2
4. d)	Explain the effect of source impedance on converter operation.	5	3	3	1,2
Unit-IV					
5. a)	A Boost converter is operating at a switching frequency of 2kHz. The input voltage is 20V. Assuming ideal filter inductor and capacitors, determine the average output voltage and average output current. Given the duty ratio as 0.8 and the load resistance is 10Ω.	5	4	4	1,2,3
5. b)	Derive the relation between duty ratio and average output voltage in Boost converter.	5	2	4	1,2
OR					
5. c)	Explain the operation of Buck- Boost converter with neat sketch	5	4	4	1,2
5. d)	A Buck converter is operated at a duty ratio of 0.8. The load resistance is 5Ω, the coil reactance of the inductance is 1.5Ω, and the resistance of the filter capacitor is 0.1Ω. Determine the voltage gain of the converter.	5	3	4	1,2,3
Unit-V					
6. a)	With a neat sketch, explain the operation of single phase Bridge Inverter with R load.	5	2	5	1,2
6. b)	Explain in detail about multiple pulse width modulation.	5	2	5	1,2
OR					
6. c)	Explain the operation of three phase Inverters with 120 degree conduction with waveforms.	5	2	5	1,2
6. d)	Compare 180 degree and 120 degree conduction modes of operation.	5	2	5	1,2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous) **MR-22**

B.Tech.V Semester End Examinations

(Electrical and Electronics Engineering)

(Model Question Paper)

Subject Title: Control Systems **Subject Code: EE502PC**

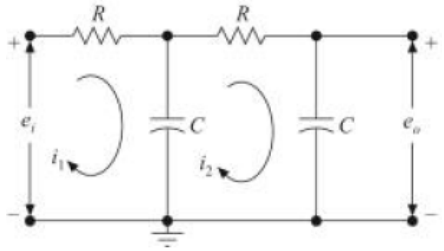
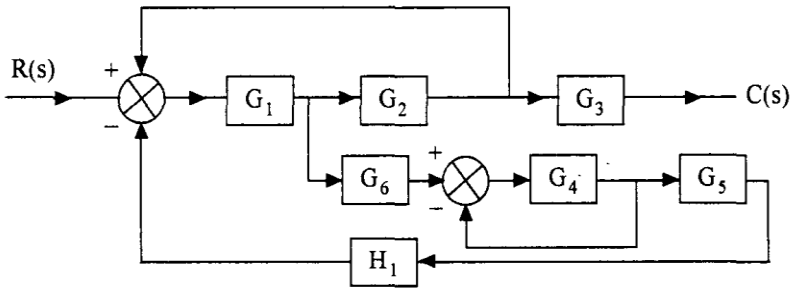
Time: 3 hours Max. Marks: 60

Note: Answer ALL Questions

Part-A (10 x 1 = 10 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	List the advantages of an Open loop systems	1	1	1	1-4
1. b)	What is the effect of feedback on the noise of a system	1	2	1	1-4
	Unit-II				
1. c)	What do you understand by the term Order of a system and the Type of a system	1	2	2	1-4
1. d)	Define the term BIBO Stability	1	1	2	1-4
	Unit-III				
1. e)	Define the term Resonant peak and Bandwidth	1	1	3	1-4
1. f)	If Gain Margin is '0' then the Phase margin is also '0'. Justify the statement	1	2	3	1-4
	Unit-IV				
1. g)	What do you mean by Cascade Compensation	1	1	4	1-4
1. h)	Draw the frequency response of a Lead Compensator	1	1	4	1-4
	Unit-V				
1. i)	List the advantages of State Space representation	1	1	5	1-4
1. j)	Define the terms Controllability and Observability	1	1	5	1-4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	For the system shown below, obtain the transfer function 	5	3	1	1-4
2. b)	Derive the expression for the transfer function of a Field controlled DC Servomotor	5	2	1	1-4
	OR				
2. c)	Differentiate between Open Loop and Closed loop systems	3	1	1	1-4
2. d)	Obtain the transfer function of the system shown in the block diagram below using block diagram reduction algebra 	7	3	1	1-4

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Unit-II					
3. a)	Define the terms Rise Time, Peak Time, Peak Overshoot and Settling time	4	1	2	1-4
3. b)	Construct the routh array for the system represented by the characteristic polynomial and find the range of 'K' for which the system is stable. $D(s) = s^4 + 20Ks^3 + 5s^2 + 10s + 15$	6	3	2	1-4
OR					
3. c)	The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K}{s(Ts+1)}$. If the system reaches a maximum amplitude of 1.26 at 4s, find the values of K and T	5	4	2	1-4
3. d)	Give the steps for the construction of the root locus diagram	5	2	2	1-4
Unit-III					
4. a)	Obtain the expression for the resonant frequency and resonant peak	5	2	3	1-4
4. b)	Sketch the polar plot of the system described by the transfer function $G(s) = \frac{K}{s(s+5)(s+10)}$.	5	3	3	1-4
OR					
4. c)	Draw the bode plot for the system described by the transfer function$G(s) = \frac{2000\,(s+1)}{s\,(s+10)(s+40)}$	8	4	3	1-4
4. d)	State the condition for stability using principle of argument in Nyquist plot	2	1	3	1-4
Unit-IV					
5. a)	What is the effect of addition of a pole to the open loop transfer function on the performance of the system	4	2	4	1-4
5. b)	Derive the expression for the transfer function of a Lag compensator and show the pole zero configuration and the frequency response of the same	6	3	4	1-4
OR					
5. c)	List out the advantages and disadvantages of the PI, PD Controllers	5	2	4	1-4
5. d)	Write the steps to be followed to design a lead compensator in the frequency domain	5	2	4	1-4
Unit-V					
6. a)	Derive the expression for the complete solution of the state equation	5	2	5	1-4
6. b)	Obtain the transfer function of the system described by the state model $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u;\ y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$	5	2	5	1-4
OR					
6. c)	List out the properties of the state transition matrix	4	1	5	1-4
6. d)	Compute the state transition matrix for the system described by the system matrix $A = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$ using Laplace transform technique	6	3	5	1-4

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech.V Semester End Examinations
(Electrical and Electronics Engineering)
(Model Question Paper)

MR-22

Subject Title: **Electrical Machines-III** Subject Code: **EE503PC**
Time: 3 hours Max. Marks: 60

Note: Answer ALL Questions
Part-A (10 x 1 = 10 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define Pitch Factor?	1	1	1	1,2
1. b)	Mention the nature of armature reaction at lagging power factor?	1	1	1	1,2
	Unit-II				
1. c)	Zero regulation is possible at which power factor?	1	2	2	2,3
1. d)	Which method is most accurate method for determination of voltage regulation for Turbo Alternator?	1	2	2	2,3
	Unit-III				
1. e)	What is synchronization of alternators?	1	1	3	1,2
1. f)	What is floating of alternator?	1	1	3	1,2
	Unit-IV				
1. g)	Mention the purpose of damper winding in synchronous motor?	1	1	4	2,3
1. h)	What is synchronous condenser?	1	1	4	2,3
	Unit-V				
1. i)	Write any two applications of universal motor?	1	2	5	2
1. j)	Mention the name two windings used in single phase induction motor?	1	1	5	2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Derive the distribution factor using fundamentals?	5	4	1	1
2. b)	A three phase, 50 Hz, two pole star connected turbo alternator has 54 slots with 4 conductors per slot. The pitch of the coils is 2 slots less than pole pitch. If the machine gives 2200 V between the lines on the open circuit with sinusoidal flux distribution, find the useful flux per pole?	5	3	1	2
	OR				
2. c)	Describe various types of A.C. generators indicating their applications?	5	3	1	1
2. d)	A straight line law connects terminal voltage and load of a three phase star connected alternator delivering current at 0.8 power factor lagging. At no-load, the terminal voltage is 3800 V and at full load of 2088 kW, it is 3200 V. Find the terminal voltage when delivering a current to a three phase, star connected load having a resistance of 12 ohms and a reactance of 7 ohms per phase. Assume the constant speed and field excitation?	5	4	1	2
	Unit-II				
3. a)	Develop a solution for regulation of a salient pole synchronous generator?	5	5	2	1,2
3. b)	A 550V, 55kVA, 1-Phase alternator has an effective resistance of 0.2Ω. A field current of 10 A produces an armature current of 200 A on short-circuit and an electromotive force of 450 V on open circuit. Calculate the full load regulation with 0.8 power factor lagging?	5	4	2	1,2
	OR				
3. c)	Explain clearly the ZPF method of determining the regulation of the alternator?	5	2	2	1,2

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3. d)	The open and short circuit test readings for a three star connected 1000 KVA 2000 V and 50 Hz alternator are given below: VOC(Line) 800 1500 1760 2000 2350 2600 ISC(A) - 200 250 300 - - IF(A) 10 20 25 30 40 50 The armature effective resistance is 0.2 Ω/phase. Estimate the full load voltage regulation using M.M.F. method for 0.8 p.f lag?	5	3	2	2
Unit-III					
4. a)	A synchronous generator is connected to infinite bus. Discuss with the help of phasor diagrams the affect of changing excitation at constant mechanical input?	5	5	3	1
4. b)	Two identical 3-Ph alternators working in parallel and supply a total load of 1000 kW at 10 kV at a power factor of 0.8 lag. Each machine supplies half the total power. The synchronous reactance of each is 50 Ω per phase and the resistance is 4 Ω per phase. The field excitation of the first machine is so adjusted that its armature current is 50 A lagging. Determine the armature current and the generated voltage of the second machine?	5	4	3	2
OR					
4. c)	Explain the role of synchronous generators operation when connected to an infinite bus?	5	3	3	1,2
4. d)	What is synchronizing Power? Derive equations for synchronizing power of cylindrical rotor and salient pole alternators?	5	4	3	2
Unit-IV					
5. a)	Draw and explain the phasor diagram of synchronous motor operating with lagging and unity power factor conditions?	5	4	4	1,2
5. b)	Derive the torque equation of the synchronous motor	5	4	4	2
OR					
5. c)	Derive an expression for power developed in a cylindrical rotor synchronous motor in terms of load angle and synchronous impedance?	5	4	4	1,2
5. d)	A 3-φ synchronous motor absorbing 50 kW is connected in parallel with a factory load of 200 kW having lagging pf of 0.8. If the combined load has a pf of 0.85 lagging, what is the value of leading kVAR supplied by the motor and at what power factor it is working?	5	3	4	2
Unit-V					
6. a)	Explain the construction and working of AC Series motor. Also explain the function of compensating winding in a.c series motor?	5	2	5	1
6. b)	Explain the constructional details and principle of operation of a split phase induction motor and also mention its applications?	5	2	5	2
OR					
6. c)	Explain the Construction and Principle of Shaded pole Motor?	5	2	5	2,3
6. d)	Using double field revolving theory, explain the torque-slip characteristics of a single phase induction motor?	5	2	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

MR-22

B.Tech. V Semester End Examinations

(Electrical and Electronics Engineering)

(Model Question Paper)

Subject Title: Power Systems Analysis **Subject Code: EE513PE**

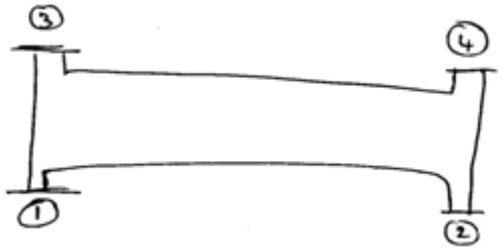
Time: 3 hours Max. Marks: 60

Note: Answer ALL Questions

Part-A (10 x 1 = 10 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What is the per unit system?	1	1	1	1
1. b)	Write the list of ways of adding impedance to existing system for the modification of Z bus matrix	1	1	1	1
	Unit-II				
1. c)	What is the need of slack bus?	1	1	2	2
1. d)	Write the Properties of nodal admittance matrix	1	1	2	1
	Unit-III				
1. e)	What is the need for load flow study?	1	1	3	3
1. f)	List the different methods of power flow studies	1	1	3	2
	Unit-IV				
1. g)	What is the significance of symmetrical components?	1	1	4	1
1. h)	What is the significance of ‘k’ or ‘a’ or ‘α’ operator	1	1	4	1
	Unit-V				
1. i)	Why symmetrical faults are more severe?	1	2	5	2
1. j)	Classify the different types of faults in power system	1	1	5	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Why do you represent a single line diagram for power system? List the assumptions that are made while drawing this diagram.	5	2	1	1
2. b)	For the power system shown in below figure. Obtain the bus incidence matrix. Take ground as reference. Is this matrix is unique? Explain. 	5	2	1	1
	OR				
2. c)	An infinite bus supplies a purely resistive 5 MW, 2.3 kV and a 7.5 MVA, 13.2 kVSynchronous motor having a sub transient reactance of 22%. Find the per unit impedances for a base of 66 kV, 15 MVA in the primary	5	3	1	2
2. d)	Explain the procedure to draw a Bus incidence matrix	5	2	1	2
	Unit-II				
3. a)	Explain the properties of Y_{bus} system	5	2	2	1
3. b)	Draw and explain the equivalent circuit of 3 bus system and derive the static load flow equations.	5	2	2	3
	OR				

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3. c)	Explain the significance of various buses in power system	5	2	2	12
3. d)	Derive mathematical expression for load flow equation	5	4	2	1
Unit-III					
4. a)	Explain the importance of power flow studies.	5	3	3	2
4. b)	Compare merits and demerits of various load flow methods	5	2	3	3
OR					
4. c)	Derive the mathematical expression for Newton-Raphson method in rectangular form for load flow solution	5	3	3	4
4. d)	Explain decoupled load flow method	5	2	3	2
Unit-IV					
5. a)	Derive the expressions for sequence impedances and draw the sequence impedance diagrams for a 3-phase synchronous generator whose stator winding neutral is solidly grounded.	5	5	4	1
5. b)	Explain the significance of zero sequence currents for star connected neutral ground systems		2	4	2
OR					
5. c)	An unbalanced 3 phase delta load, constituting resistances of 4.1 Ω, 6 Ω and 10 Ω connected in delta formation and connected to a balanced three phase system of 200 V line to line. Find the positive, negative and zero sequence currents in the load circuits and in the supply lines.	5	3	4	3
5. d)	Explain sequence network of transformer for various possible primary and secondary winding combinations	5	2	4	1
Unit-V					
6. a)	Explain the various classifications of faults.	5	2	5	6
6. b)	Derive mathematical expression for sequence component for SLG fault	5	2	5	12
OR					
6. c)	Derive mathematical expression for sequence component for LLL fault	5	3	5	1
6. d)	Derive mathematical expression for sequence component for LLG fault	5	4	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

MR-22

B.Tech. V Semester End Examinations

(Common to CE, EEE, ME, ECE, MCT, MME & CSM)

(Model Question Paper)

Subject Title: Business Economics and Financial Analysis **Subject Code: MS501HS**

Time: 3 hours Max. Marks: 60

Note: Answer ALL Questions

Part-A (10 x 1 = 10 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define Business Economics	1	1	1	1
1. b)	What is meant by National Income?	1	1	1	7
	Unit-II				
1. c)	Describe Cross Elasticity of Demand	1	2	2	12
1. d)	What are the Determinants of supply?	1	1	2	7
	Unit-III				
1. e)	Explain Monopolistic Competition	1	2	3	7
1. f)	What is meant by Marginal Cost?	1	1	3	11
	Unit-IV				
1. g)	Describe Accounting Equation	1	2	4	11
1. h)	What is meant by Materiality Convention?	1	1	4	8
	Unit-V				
1. i)	Explain Liquidity	1	2	5	11
1. j)	List Profitability ratios	1	1	5	11

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain different sources of capital.	5	2	1	1
2. b)	Describe the advantages and disadvantages of sole proreitorship.	5	2	1	7
	OR				
2. c)	Explain the nature and scope of Business Economics.	5	2	1	7
2. d)	Differentiate between Private Limited Companies and Public Limited Companies	5	4	1	7
	Unit-II				
3. a)	Describe Law of Demand and its exceptions	5	2	2	11
3. b)	Explain the Determinants of Supply and supply function.	5	2	2	7
	OR2				
3. c)	The quantity demanded for the product X is 30 units, when the price is Rs.15. The quantity demanded increased to 40 units, as price decreased to Rs. 10. Compute Price Elasticity of demand.	5	3	2	2
3. d)	Explain different methods of Demand Forecasting	5	2	2	12
	Unit-III				
4. a)	How can a producer determine the least-cost combination of inputs?	5	1	3	3
4. b)	Differentiate between perfect competition and monopoly competition.	5	4	3	8
	OR				
4. c)	Explain Law of Variable Proportions with the help of graph.	5	2	3	7
4. d)	Describe various Pricing strategies used by modern business organizations.	5	2	3	5
	Unit-IV				
5. a)	Classify the following accounts into various (Personal, Real or Nominal) types of accounts. i) Salary account ii) Outstanding wages account iii) Rent account	5	2	4	11

	iv) Bank account v) Insurance prepaid vi) Drawings account vii) Bad debts account viii) Machinery account ix) Furniture account x) Patents account				
5. b)	Journalise the following transactions: Jan 1, 2021 Commenced with Cash Rs. 8,00,000 Jan 3, 2021 Purchased Goods worth Rs. 1,50,000 Jan 8, 2021 Sold Goods to Mr. Ramu Rs. 1,10,000 Jan 30, 2021 Salaries paid Rs. 40,000 Jan 30, 2021 Rent paid Rs. 20,000	5	3	4	11
	OR				
5. c)	Explain Double Entry System and its advantages	5	2	4	11
5. d)	Prepare Trading and Profit and Loss account from the following information.	5	3	4	11

Trial Balance as on 31.03.2021

Particulars	Debit(₹)	Credit(₹)
Capital		1,00,000
Purchases	40,000	
Furniture	30,000	
Interest received		3,000
Cash	15,000	
Debtors	27,000	
Office Stationery	3,000	
Machinery	70,000	
Bank Loan		5,000
Bills Payable		2,000
Opening Stock	10,000	
Sales		90,000
Wages paid	600	
Salaries paid	2,500	
Electricity charges	1,200	
Insurance paid	700	
Total	2,00,000	2,00,000

Adjustments:

i) Closing Stock ₹ 12,000
ii) Depreciate Machinery @10% p.a.
iii) Salaries outstanding ₹ 500

	Unit-V				
6. a)	How accounting ratios are useful in the inter-firm comparison.	5	1	5	10
6. b)	From the given Balance Sheet calculate: a) Debt-equity ratio b) Liquidity ratio c) Fixed assets to current assets ratio and d) Fixed assets to Net worth ratio.	5	3	5	10

Balance Sheet

Liabilities	Rs.	Assets	Rs.
Share Capital	1,00,000	Goodwill	60,000

		Retained Earnings	10,000	Machinery	1.00,000					
		Profit and loss a/c	40,000	Stock	30,000					
		Secured loans	80,000	Debtors	70,000					
		Creditors	40,000	Furniture	10,000					
		Provision for taxation	30,000	Cash	30,000					
			3,00,000		3,00,000					
OR										
6. c)	Differentiate Liquidity ratios and leverage ratios.						5	4	5	11
6. d)	The Balance Sheet of ABC Limited as on 31-03-2018 was as follows: **Liabilities** / **Amount (₹)** / **Assets** / **Amount (₹)** Equity Share Capital 1,40,000 — Plant and Machinery 1,24,000 Reserves and Surplus 1,28,000 — Land and Buildings 1,30,000 Debentures 26,000 — Furniture & Fixtures 26,000 Creditors 4,000 — Stock 2,000 Bank overdraft 6,000 — Debtors 22,000 Provision for Taxation: 2,000 — Investments (Short-term) 4,000 Outstanding Expenses 2,000 — Cash 65,000 Bills payable 2,000 — Cash at Bank 55,000 440,000 — 440,000 From the above, compute and interpret a) Current Ratio b) Quick Ratio c) Absolute Liquid Ratio d) Debt-Equity Ratio e) Proprietary Ratio.						5	3	5	11

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome