MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
(Autonomous)
B.Tech. III Semester End Examinations
(Model Question Paper)

MR-21

Course Title: Engineering Mechanics   **Course Code: ME331ES**
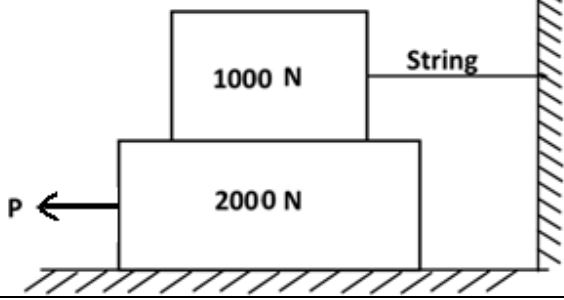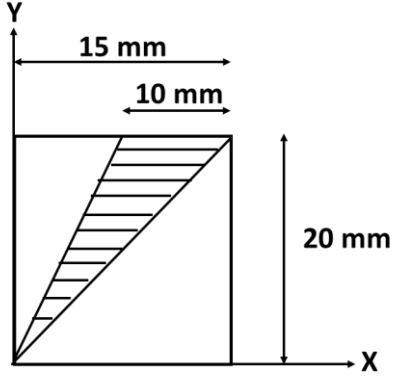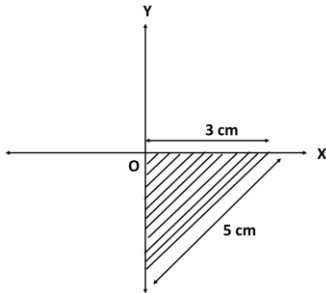
Time   : 3 hours   Max. Marks   : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Write Conditions for equilibrium for Co-planar Concurrent and Co-planar Non Concurrent force systems.	2	2	1	1
1. b)	Define Moment of force and couple.	2	1	1	1
	Unit-II				
1. c)	Define coefficient of friction and angle of repose.	2	1	2	1
1. d)	Why friction is a necessary evil, explain with relevant examples?	2	2	2	1
	Unit-III				
1. e)	Differentiate centroid and center of gravity.	2	2	3	2
1. f)	Derive expression for Centroid of line of length L.	2	1	3	1
	Unit-IV				
1. g)	Define polar moment of inertia and derive expression for it.	2	2	4	1
1. h)	What is radius of gyration, explain with sketch and expression.	2	2	4	1
	Unit-V				
1. i)	A ball dropped from 1 Km height from earth's surface, determine its velocity just before touching the surface.	2	3	5	2
1. j)	State and explain Work-Energy Principle with suitable example.	2	2	5	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the question	M	L	CO	PO
	Unit-I				
2. a)	If clockwise Moment about point O is 400 N-m, then find the value of F?	4	2	1	2
b)	Classify System of Forces, explain each in detail with neat sketch.	6	2	1	1
	OR				
2. c)	Define Free body Diagram and Explain with neat sketch space diagram and Free body diagram, what forces are involved in ladder wall application if wall and floor are rough?	4	2	1	1
2. d)	A beam AB 170 m long is loaded as shown in figure below. Determine the reactions at A & B.	6	3	1	4

	Unit-II				
3. a)	Explain the laws of Friction.	4	1	2	1
3. b)	If μ= 0.3 for all pair of surfaces, what should be the value of P, such that 2000 N block is impending towards left side as shown in the figure below.	6	4	2	3
	OR				
3. c)	Explain the causes of friction. Why kinetic friction is always less than limiting friction?	4	2	2	1
3. d)	Drive relation between tight side tension and slack side tension in flat belt and pully friction, where angle of overlap is θ and coefficient of friction between belt and pulley is μ.	6	3	2	1
	Unit-III				
4. a)	From first principle derive centroid distance of semicircular arc from its diametric axis.	4	3	3	1
4. b)	Determine the centroid of the shaded region.	6	4	3	3
	OR				
4. c)	State and explain Pappu's theorem I and II with suitable examples.	4	2	3	1
4. d)	Using first principal derive location center of gravity for cone of radius R and height h from base center.	6	3	3	1
	Unit-IV				
5. a)	Using first principal, derive MI of a triangle with base b and height h about its centroidal axis	4	3	4	1
5. b)	Determine the MI of shaded region about X and Y axis.	6	3	4	3
	OR				
5. c)	State and explain and derive transfer formulae/parallel axis theorem for mass moment of inertia?	4	2	4	1
5. d)	Using first principal, derive Mass Moment of inertia of a solid cone about its axis of rotation having radius R, height h and mass M.	6	2	4	1
	Unit-V				
6. a)	Explain the following (i) Impulse – Momentum equation (ii) Conservation of Momentum (iii) Coefficient of restitution (iv) Oblique Impact	4	2	5	1
6. b)	A 600mm diameter flywheel is brought uniformly from rest to a speed of 350 rpm in 20 seconds. Determine the velocity and acceleration of a point on the rim 2	6	4	5	3

	seconds after starting from rest.					
	OR					
6. c)	State and explain Work – Energy Principle, explain with suitable example how it can be used to solve dynamics problems.	4	2	5	1
6. d)	Determine the constant force P that will give the system of bodies shown in Figure velocity of 3m/sec after moving 4.5m from rest. Coefficient of friction between the blocks and the plane is 0.3. Pulleys are smooth.	6	3	5	3

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

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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B.Tech. III Semester End Examinations
(Model Question Paper)

MR-21

Course Title: Electrical Circuit Analysis　　　　**Course Code: EE301PC**
Time: 3 hours　　　　　　　　　　　　　　　　　Max. Marks: 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define Super position Theorem	2	3	1	1
1. b)	What is a Dual network?	2	3	1	1
	Unit-II				
1. c)	Define Average and RMS Value of a Sinusoidal Wave form	2	3	3	1
1. d)	Define Resonance in RLC Circuit	2	3	3	1
	Unit-III				
1. e)	Define self induced EMF and Mutual induced EMF.	2	3	3	1
1. f)	What is the relation between line current and phase current in a three phase star connected system and also relation between line voltage and phase voltage in a three phase star connected system	2	3	3	1
	Unit-IV				
1. g)	Define Time Response Analysis of a RLC Circuit	2	3	2	1
1. h)	What is a Time constant for a series RL Circuit?	2	3	2	1
	Unit-V				
1. i)	What are the equations of a Y – Parameters in a two port network?	2	3	4	1
1. j)	What is the Reciprocity and Symmetry condition for a Z- Parameters in a two port network?	2	3	4	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2.a)	Define Maximum Power Transfer theorem.	2	3	1	1
2.b)	The network shows a voltage source through T Circuit. What should be the value of a pure resistive load to be connected across the terminals A and B so that maximum power is received and find the power value Fig 2.b)	8	2	1	2

	OR				
2. c)	Define Milliman's theorem	2	3	1	1
2. d)	Draw the Dual network for the following circuit.	8	2	1	2

Fig 2-d)

	Unit-II				
3. a)	Define Peak Factor and Form Factor for a sinusoidal wave form	2	3	3	1
3. b)	A series circuit consisting of 25Ω resistor, 64mH inductor and 80 µF capacitor is connected to a 110V, 50Hz single phase supply. Calculate the current, Voltage across each element and draw phasor diagram	8	2	3	2
	OR				
3. c)	Define Resonance frequency and Band width of a series RLC circuit	2	3	3	1
3. d)	A series RLC circuit consists of resistance R=20Ω, L=0.01H and C=0.04µF. Calculate resonance frequency, lower cut off frequency, higher cut off frequency, Band width and Quality factor	8	2	3	2
	Unit-III				
4. a)	Define coefficient of coupling	2	3	3	1
4. b)	In a coupled circuit shown below calculate the voltage across 5Ω resistor	8	2	3	2

Fig 4 · b)

	OR				
4. c)	What is the relation between line voltage and phase voltage in a three phase Delta connected system and also relation between line current and phase current in a three phase Delta connected system	2	3	3	1
4. d)	A Delta connected load (8+j6)Ω per phase is supplied from three phase 440V source. Find the line voltage, Line current, Power factor, Total Power and Power per phase.	8	2	3	2
	Unit-IV				
5. a)	Derive the DC response of a series RL circuit using differential equation approach.	2	3	2	1
5. b)	A series RL Circuit with R=30Ω, L=15 Henry has a constant voltage V=60V applied at t=0. Determine the current I, the voltage across the resistor and inductor using differential equation approach	8	2	2	2

	OR				
5. c)	Derive DC response of a series RC circuit using differential equation approach	2	3	2	1
5. d)	A Series RC circuit consists of R=10Ω, C=0.1F. A constant voltage of 20V is applied to the circuit at t=0. Obtain the current equation and determine the voltages across the resistor and the Capactor.	8	2	2	2
	Unit-V				
6. a)	What are the ABCD parameter equations	2	3	4	1
6. b)	For the given circuit calculate Z- parameters hence calculate the ABCD parameters. Find whether the network is reciprocal or symmetrical Fig 6.b)	8	2	4	2
	OR				
6. c)	What are the h parameter equations	2	3	4	1
6. d)	Calculate h parameters and verify the reciprocity and symmetrical conditions Fig 6.d)	8	2	4	2

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MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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B.Tech. III Semester End Examinations
(Model Question Paper)

MR-21

Course Title: Electrical Machines-I　　　　　　　　**Course Code: EE302PC**
Time: 3 hours　　　　　　　　　　　　　　　　　　　Max. Marks: 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What is multiplex winding?	2	1	1	1
1. b)	What is the purpose of laminating the armature?	2	1	2	2
	Unit-II				
1. c)	Define Back EMF.	2	2	1	4
1. d)	How commutation takes place in DC motor?	2	2	1	2
	Unit-III				
1. e)	What is the purpose of conducting brake test?	2	1	4	6
1. f)	What are the limitations of field's test?	2	1	2	4
	Unit-IV				
1. g)	What is the effect of variation of supply voltage on iron losses?	2	1	4	2
1. h)	How to minimize hysteresis loss?	2	2	3	7
	Unit-V				
1. i)	What is an auto transformer?	2	1	5	6
1. j)	Draw schematic diagram of open delta connection of 3-phase Transformer.	2	4	5	4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2.a)	Explain the constructional features of DC generator in detail.	5	1	1	1
2.b)	A 4-pole generator has a wave-wound armature with 722 conductors, and it delivers 100 A on full load. If the brush lead is 8 Degrees. Calculate the armature demagnetizing and cross magnetizing ampere turns per pole.	5	3	2	3
	OR				
2. c)	Derive the expression for demagnetizing AT/pole.	5	2	1	5
2. d)	Draw a developed diagram of 2 layer lap winding for a 4 pole DC generator with 16 coils.	5	4	2	4
	Unit-II				
3. a)	Explain the principle of operation of DC motor in detail.	5	2	1	2
3. b)	A 200 V d.c shunt motor with an armature resistance of 0.3Ω is excited to give constant main field. At full load the motor runs at 600 rpm and takes an armature current of 30 A. If a resistance of 1Ω is placed in the armature circuit, find the speeds at full load torque and double full load torque.	5	5	2	6
	OR				
3. c)	With the help of neat sketch, explain the working of 3 point starter.	5	1	1	7
3. d)	A 200V DC shunt motor runs at 600 rpm when the armature current is 30A. Calculate the speed if the torque is doubled. Given that Ra = 0.18 Ω.	5	3	2	9

	Unit-III				
4. a)	Explain the procedure of conducting brake test on d.c. machine with a neat circuit diagram.	5	1	3	2
4. b)	With the help of neat sketch, explain about swinburne's test.	5	2	2	5
	OR				
4. c)	Explain in detail about the purpose of conducting various tests on DC machines.	5	1	1	4
4. d)	With the help of neat sketch, explain the Hopkinson's test.	5	2	2	6
	Unit-IV				
5. a)	Draw the equivalent circuit of single phase transformer and explain.	5	3	3	7
5. b)	A 8 KVA, single phase transformer has a turns ratio of 8:3 and is supplied from a 2.0 KV supply. Neglecting Losses, determine (i) Primary current (ii) The full load secondary current (iii) The secondary Voltage.	5	5	4	9
	OR				
5. c)	Define all day efficiency? Derive the expression.	5	1	3	7
5. d)	The percentage resistance and percentage leakage reactance of a 5 kVA, 500 V/ 1000 V, 50 Hz., single phase transformer are respectively 3% and 4%. Calculate the voltage to be applied to the HV side to carry out short circuit test at rated current and also calculate the voltage to be applied to the LV side to carry out short circuit test at half the rated current.	5	3	3	10
	Unit-V				
6. a)	A 5KVA, 1000/200 V, 50 Hz single phase transformer gave the following test results: Open circuit test (LV side): 200 V, 1.2 A, 90 W Short circuit test (HV side): 50 V, 5 A, 110 W. Compute the parameters of approximate equivalent circuit referred to LV side.	5	4	4	12
6. b)	With the help of neat sketch, explain in detail about parallel operation of single phase transformers.	5	3	3	6
	OR				
6. c)	Explain the operation of 1-phase Auto Transformer with neat sketch.	5	2	3	4
6. d)	Give the comparison of autotransformer with two winding transformer on various aspects.	5	1	3	5

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MR-21

Course Title: Electromagnetic Fields **Course Code: EE303PC**
Time: 3 hours Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	State Coulombs Law?	2	1	1	1
1. b)	Define electro static potential?	2	1	1	2
	Unit-II				
1. c)	Analyze capacitance of the parallel plate capacitor when n number of dielectrics are placed in between them?	2	4	2	3
1. d)	Illustrate ohms law in point form?	2	2	2	1
	Unit-III				
1. e)	What is the importance of Biot Savarts law in magnetostatics?	2	1	3	1
1. f)	Write any two applications of Scalar magnetic potential?	2	3	3	4
	Unit-IV				
1. g)	What is magnetic energy?	2	1	3	1
1. h)	What is the relationship between magnetic force and magnetic field?	2	1	4	1
	Unit-V				
1. i)	Explain displacement current density?	2	5	4	2
1. j)	What is the Integral form of faradays laws of electromagnetic induction?	2	1	4	4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Determine Electric field intensity (E) at any point P due to infinite line charge distribution ρ_L?	7	2	1	1
2. b)	An electric field E=3ax+4ay-12az V/m exists in a dielectric material which has relative permittivity 3.Obtain the energy density?	3	1	1	2
	OR				
2. c)	Illustrate Gauss law in point form for electrostatics and find electric field intensity due to infinite sheet charge by applying Gauss law?	7	2	1	1
2. d)	Derive electric field intensity due to an electric dipole?	3	1	1	3
	Unit-II				
3. a)	State and explain the continuity equation of current in integral form and point form.	5	2	2	1
3. b)	What is the capacitance of capacitor consisting of two parallel plates 30cm by 30cm, separated by 5mm in air? What is the energy stored by the capacitor if it is charged to a potential difference of 500v?	5	3	2	2
	OR				
3. c)	Analyze Poisson's and Laplace's equations in electrostatics?	5	4	1	4
3. d)	Explain the boundary conditions between dielectric to dielectric interface in electrostatics?	5	5	2	4
	Unit-III				
4. a)	Apply amperes law to derive magnetic field intensity at any point P due to finite length conductor?	6	3	2	2
4. b)	Derive Maxwells second law for magnetostatics?	4	2	4	1

		M	L	CO	PO
	OR				
4. c)	Explain the concept of vector magnetic potential with necessary equations?	5	2	3	1
4. d)	A conductor 15m long lies along z direction with a current of 6amps in az direction. Find the force experienced by the conductor if B=0.09ax T?	5	3	3	2
	Unit-IV				
5. a)	Derive the force between differential current elements?	6	1	4	3
5. b)	A current strip 2cm wire carries a current of 15A along a_z direction. Find the force on the strip of unit length. If the uniform field is 0.2 a_y T	4	1	4	2
	OR				
5. c)	Develop Lorentz force equation and determine force on a moving charge?	4	3	2	3
5. d)	Derive magnetic boundary conditions?	6	2	3	2
	Unit-V				
6. a)	Explain point form of Faradays law for time varying fields?	5	5	3	3
6. b)	State Maxwell's equations in point form and integral form for static fields and time varying fields?	5	1	4	3
	OR				
6. c)	Derive the Poynting theorem and explain its physical significance?	7	3	3	4
6. d)	Explain motional electro motive forces?	3	2	4	1

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MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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MR-21

Course Title: Analog Electronics   **Course Code: EC332PC**
Time: 3 hours   Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	List the difference between Ideal and practical diode.	2	1	1	1
1. b)	What is load line analysis?	2	1	1	1,2
	Unit-II				
1. c)	How MOSFET acts as switch?	2	4	1	1,2
1. d)	Define Transconductance?	2	1	1	1
	Unit-III				
1. e)	Classify power amplifiers.	2	2	3	1,2
1. f)	Discuss different types of coupling schemes used in Amplifiers.	2	2	3	1,2,3
	Unit-IV				
1. g)	Write general characteristics of negative feedback amplifiers?	2	2	3	1,2,3
1. h)	Why LC oscillators are not used at low frequencies?	2	4	3	1,2
	Unit-V				
1. i)	Write the features of Op-amp.	2	1	4	1,2
1. j)	What is meant by Virtual Ground Concept?	2	2	4	1,2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain the V-I characteristics of PN Junction diode with neat circuit diagram.	5	2	1	1,2
2. b)	Give comparison between half wave and full wave rectifiers.	5	4	2	1,2
	OR				
2. c)	Draw the small signal equivalent model of transistor amplifier and explain.	5	2	2	1,2,3
2. d)	A CE amplifier is drawn by a voltage source of internal resistance R_S=800Ω and the load impedance is a resistance R_L = 1000Ω. The h-parameters are hie=1KΩ, hre=2×10⁻⁴, hfe=50 and hoe = 25μA/V. Compute the current gain Ai, input resistance Ri, voltage gain Av and output resistance Ro.	5	4	2	3,4
	Unit-II				
3. a)	Explain the characteristics of Depletion MOSFET.	5	2	1	1,2
3. b)	Draw the MOSFET High frequency equivalent circuit and explain.	5	3	1	1,2,3
	OR				
3. c)	Calculate the expression for Av, Ri & Ro for CS amplifier with resistive load.	5	4	1	3,4
3. d)	Distinguish between E-MOSFET and DE-MOSFET	5	4	1	1,2
	Unit-III				
4. a)	Describe the operation of Class B Push pull amplifier.	5	2	3	1,2
4. b)	Write the applications of Power amplifiers	5	1	3	1
	OR				
4. c)	Derive the expression for the efficiency of a Push Pull Class-B Power Amplifier.	5	4	3	3,4
4. d)	Describe the principle of operation of class-C amplifier.	5	2	3	1,2
	Unit-IV				
5. a)	Explain the principle of negative feedback in amplifiers.	5	2	3	1,2
5. b)	Draw the circuit diagram of a Wien bridge oscillators and derive the expression for frequency of oscillation.	5	4	3	1,2,3
	OR				
5. c)	Derive the input & output impedance of voltage series feedback amplifiers.	5	4	3	1,2
5. d)	An amplifier has a value of R_{in} = 4.2kΩ, A_v=220 and β=0.01, determine the value of input resistance with feedback.	5	4	3	2,3
	Unit-V				
6. a)	Calculate the Gain of Inverting amplifier.	5	2	4	1,2
6. b)	Write the Ideal characteristics of Op-Amp.	5	2	4	1
	OR				
6. c)	Explain the operation of square wave generator.	5	2	4	1,2
6. d)	Write the limitations of Integrator circuit and how it overcomes practically	5	2	4	1,2

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

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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MR-21

Course Title: Constitution of India   **Course Code: MC301HS**
Time: 3 hours   Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define Constitution of India	1	1	1	6,8
1. b)	List the drafting committee of constitution of India	1	1	1	6,8
	Unit-II				
1. c)	What do you mean by fundamental duties in Indian constitution	1	1	2	6,8
1. d)	List the fundamental rights.	1	1	2	6,8
	Unit-III				
1. e)	List the classification of directive principles of state policy.	1	1	3	6,8
1. f)	Briefly write about directive principles	1	2	3	6,8
	Unit-IV				
1. g)	List out the three types of emergencies under Indian Constitution	1	1	4	6,8
1. h)	State the important amendments.	1	1	4	6,8
	Unit-V				
1. i)	What is Union Public service commission?	1	1	5	6,8
1. j)	Define Election commission of India.	1	1	5	6,8

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Give detail account on the historical background of Indian Constitution.	5	1	1	6,8
2. b)	Define. Explain the importance of preamble in the implementation of constitution.	5	2	1	6,8
	OR				
2. c)	Describe the salient features of Indian Constitution.	5	3	1	6,8
2. d)	Discuss in detail the fundamental right to equality.	5	3	1	6,8
	Unit-II				
3. a)	Explain the scope of the right to life and personal liberty.	5	2	2	6,8
3. b)	Discuss in detail the fundamental duties of every citizen.	5	3	2	6,8
	OR				
3. c)	Explain the needs and importance of fundamental duties of an Indian Citizen.	5	2	2	6,8
3. d)	Explain fundamental right to certain freedom	5	2	2	6,8
	Unit-III				
4. a)	State the Directive Principles of State Policy and explain its significance.	5	1	3	6,8
4. b)	Distinguish between fundamental rights and directive principles of state policy.	5	5	3	6,8
	OR				
4. c)	Discuss the views of Gandhian Principles in Directive Principles of State Policy.	5	3	3	6,8
4. d)	State the importance of directive principles of state policy.	5	1	3	6,8
	Unit-IV				
5. a)	Explain the power of the parliament to amend the constitution referring to decided case	5	2	4	6,8
5. b)	Describe the procedure of amendment of the constitution.	5	2	4	6,8
	OR				
5. c)	Discuss in detail the federal structure and distribution of legislative and financial powers between the union and states.	5	3	4	6,8
5. d)	List out the effects of financial emergency.	5	1	4	6,8
	Unit-V				
6. a)	Classify the role of Local Government.	5	2	5	6,8
6. b)	Write shorts on finance commission of India	5	3	5	6,8
	OR				
6. c)	What are the important provisions relating to the Election Commission in the Indian Constitution	5	2	5	6,8
6. d)	List the important constitutional bodies and explain about election commission of India	5	1	5	6,8

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