Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End/[redacted] Semester AY2025-2026

01/12/2025

Program: B. Tech Electrical Third year Ele Sem V **Duration: 3 Hr**

Course Code: PC-BTE505 **Maximum Points: 100**

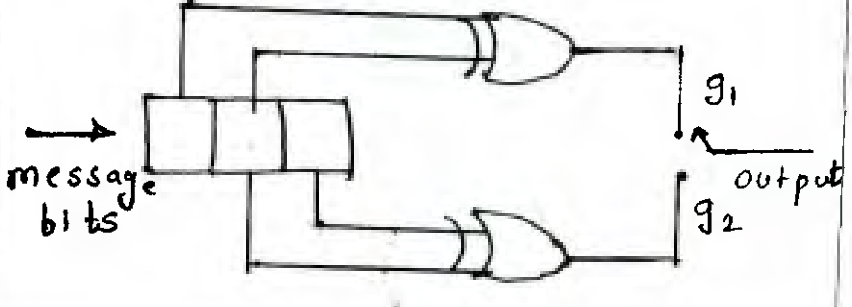
Course Name: Communication Engineering **Semester: V**

Note: Q1 is compulsory. Solve any four questions out of remaining six questions

Assume suitable data if required.

Q. No	Questions		Points	CO	BL	Module no
1	(i)	Why is the source coding important in digital communication? What is the principle behind any source coding?	04	2	3	5
	(ii)	Compare simplex, half duplex and full duplex communication systems	04	4	2	7
	(iii)	Compare BPSK, DPSK, DEPSK, QPSK and QASK modulation systems in terms of signal representation and bandwidth.	04	1	2	2
	(iv)	What is Hamming distance? How is it used to determine error detection and correction capability in channel coding?	04	3	2	6
	(v)	What is the advantage of delta modulation over pulse code modulation? What are the errors in delta modulation? How are they overcome?	04	1	3	3
2	(i)	Discuss any three characteristics of radio receivers.	05	1	2	1
	(ii)	How Independent Side Band amplitude modulation is different from Double Sideband Suppressed Carrier amplitude modulation? With neat block diagram explain Independent Side Band amplitude modulator.	05	1	2	1
	(iii)	With a neat diagram and waveforms explain DPSK modulator demodulator	05	1	2	2
	(iv)	Discus principle of FET reactance FM modulator. With neat diagram explain FET capacitive reactance FM modulator. Derive an expression for equivalent capacitor of the same	05	1	2	1

3	(i)	With neat block diagram and suitable waveforms explain Pulse Position modulator demodulator in detail.	08	1	2	3
	(ii)	With neat block diagram explain Pulse code modulator demodulator.	12	1	3	3
		A band-limited signal m(t) of 3 kHz bandwidth is sampled at rate of 33 % higher than the Nyquist rate. The maximum allowable error in the sample amplitude (i.e., the maximum quantization error) is 0.5% of the peak amplitude m_p . Assume binary encoding. Find the minimum bandwidth of the channel to transmit the encoded binary signal.				
4 a		What are the different ways of effective bandwidth utilization methods? Justify how they are helping effective bandwidth utilization. Explain any one method in detail.	10	3	3	4
b		What are the various guided and unguided medium used for communication? Compare transmission through co axial and fiber optic cables	10	3	2	4
5 a		Define rate of information. A signal source consists of 4 symbols s1, s2, s3 and s4, represented by 00, 01, 10, 11. Each pulse interval is 3msec and all symbols are equally likely to occur. Calculate the rate of information	05	2	03	5
b		An analog signal with BW 4KHz is sampled at 1.25 times Nyquist rate and each sample is quantized into one of 128 equally likely levels. What is the information rate? What should be the SNR in db required for error free transmission if channel BW is 20KHz?	07	2	03	5
c		The seven messages m1 to m7 with probabilities 0.17, 0.1, 0.05, 0.1, 0.4, 0.03, 0.15 respectively are coded using Binary Huffman code.	08	2	03	5

	Obtain the code for each message. Calculate code efficiency. Design decoder for the same.				
6 a	Consider systematic linear block code with parity check equations are P1=m1+m2+m4 P2= m1+m3+m4 P3=m1+m2+m3 P4=m2+m3+m4 where Pi and mi are parity check and message bits a. Find generator matrix and parity check matrix b. Is the vector 10101010 is valid code word? If not, identify the error bit considering one bit error. c. Draw the decoder circuit	12	2	3	6
b	What are the characteristics of convolution encoder? For the following convolution encoder, draw state diagram and determine convolution code for message bits 1101  	082	2	3	6
7	Write a short note on 1. TCP/IP protocol 2. Network Topology 3. Types of computer networks	08 06 06	4		7

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~~End~~/Reexam Semester AY2025-2026

T.Y.B.Tech Sem-V - Ele 07/01/26

Program: B. Tech Electrical **Duration: 3 Hr**

Course Code: PC-BTE505 **Maximum Points: 100**

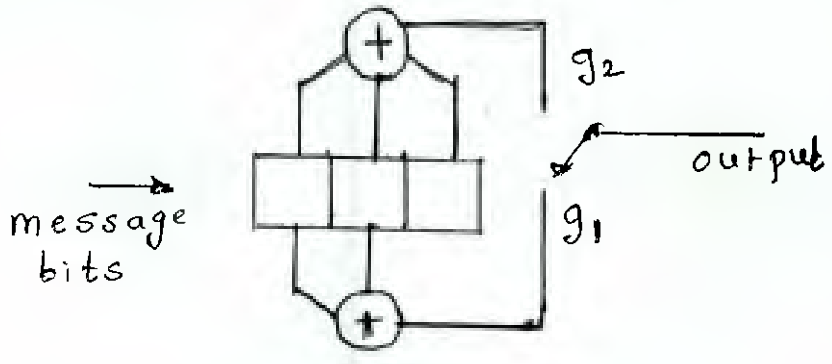
Course Name: Communication Engineering **Semester: V**

Note: Q1 is compulsory. Solve any four questions out of remaining six questions

Assume suitable data if required.

Q. No	Questions		Points	CO	BL	Module no
1	(i)	With neat block diagram explain digital communication system	04	3	2	2
	(ii)	Prove that entropy is the optimum code length	04	2	3	5
	(iii)	What is Hamming distance? How is it used to obtain error detection and error correction capability of channel coding?	04	2	2	6
	(iv)	Explain sampler and quantizer used in pulse code modulation	04	1	2	3
	(v)	What is modulation? Why is it required? Compare Amplitude Modulation with frequency modulation in terms of band width and effect of noise.	04	1	2	1
2	(i)	Compare Super heterodyne and Tuned Radio Frequency receivers	05	1	2	1
	(ii)	Draw block diagram of BPSK and DPSK transmitters and compare them with output waveforms	05	1	3	2
	(iii)	In FM system when audio frequency is 500 Hz, the Audio Frequency (AF) voltage is 2V, the deviation is 4 KHz. If AF voltage is increased to 8V, what is the new deviation? If audio voltage is raised to 16V and audio frequency is dropped to 200Hz what is the deviation? Find modulation index in each case	05	1	3	1
	(iv)	Explain flywheel effect. The amplitude modulated signal is given by $E_{AM}(t) = 10\cos(2\pi \times 10^6 t) + 5\cos(2\pi \times 10^6 t)\cos(2000\pi t) + 2\cos(2\pi \times 10^6 t)\cos(4000\pi t)$ Determine the modulation index and draw the frequency	05	1	3	1

	spectrum.				
3	(i) With neat block diagram and suitable waveforms explain Pulse Width modulator demodulator in detail.	08	1	2	3
	(ii) Explain delta modulator. Why delta modulator is replaced by adaptive delta modulator?	06	1	2	3
	(iii) Show signal representation for BPSK, QPSK and QAM systems	06	1	3	2
4 a	Explain the principle of spread spectrum technology? What is the use of spread spectrum technology? Explain frequency hopping and direct sequence spread spectrum methods with their transmitter receiver	10	3	3	4
b	Compare in detail different transmission media used in communication engineering.	10	3	2	4
5 a	Two messages m1 and m2 with probabilities 0.7 and 0.3 are to be encoded with binary Huffman code, considering sequence of three messages at time. Design the encoder and decoder for the same. Calculate code efficiency.	08	2	3	5
b	What is channel capacity and rate of information? Explain Shannon's theorem for noisy channel?	06	2	2	5
c	A high resolution black and white picture source consists of about 3 Mega pixels picture frame and 32 different brightness levels which are transmitted at the rate 40 picture frames/sec. All picture elements are assumed to be independent and all brightness levels are equi-probable. Calculate the average rate of information conveyed by this picture source.	06	2	3	5
6 a	How the error in cyclic code is detected? Generate (7, 3) systematic cyclic code for message bits 101. Determine if the received code word 111101 is valid or not. If not,	10	2	3	6

	correct the code word				
b	Compare linear block code with convolution code. For the following convolution encoder draw state diagram and determine code for message bits 1101  	10	2	3	6
7 a	Compare simplex, half duplex and full duplex communication systems	06	4	2	7
b	Explain LAN, PAN, WAN, internet networks	06	4	2	7
c	List TCP/IP protocol layers. Explain bottom three levels for the same	08	4	2	7

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End Semester Examinations /~~Re-Examinations~~ - November 2025/ January 2026

Program: T. E Third year Ele - Sem V

Course Code: PC-BTE504

Course Name: Power System Analysis

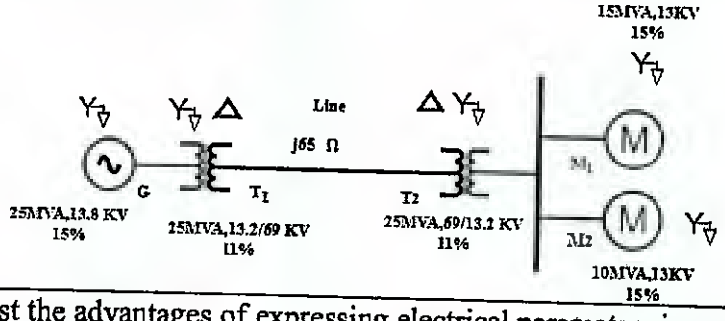
Duration: 3 h

Maximum Points: 100

Semester: V

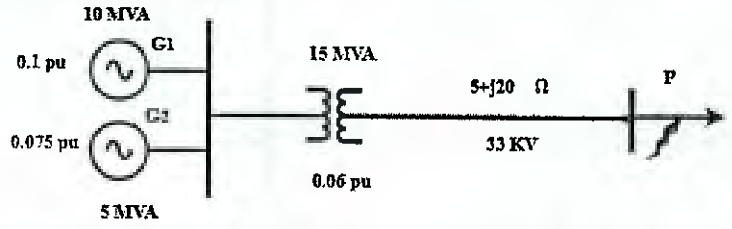
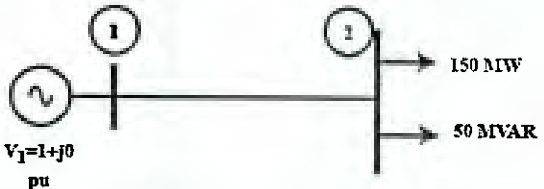
28/11/2025

- Attempt any *five* questions .
- Make suitable assumptions wherever necessary.
- Answer should have four digits after decimal.

Q.No	Questions	Points	CO	BL	Module
Q1.(a)	A one line diagram of the system is shown below. Choose 13.8 KV, generator voltage as base voltage and 25 MVA as base MVA. Sketch zero sequence network. 	8	1	3	1
Q1.(b)	List the advantages of expressing electrical parameters in per unit system.	6	1	1	1
Q1.(c)	For the power system network with the following data, compute the bus admittance matrix.	6	2	3	5
Q2.(a)	The one line diagram of a simple power system is shown below.	12	1	4	4

Bus code	Per unit line impedance	Half line charging admittance in per unit
1-2	0.05+j0.12	j0.025
2-3	0.06+j0.04	-
3-4	0.75+j0.25	j0.02
1-3	0.045+j0.045	J0.015
1-4	0.015+j0.05	-

	The neutral of each generator is grounded through a current limiting reactor of 0.25/3 per unit on base of 100MVA. The system data expressed in per unit on a common 100 MVA base is tabulated below. **Item** / **Voltage (KV)** / **X^1 (pu)** / **X^2 (pu)** / **X^0 (pu)** G_1 / 20 / 0.15 / 0.15 / 0.05 G_2 / 20 / 0.15 / 0.15 / 0.05 T_1 / 20/220 / 0.1 / 0.1 / 0.1 G_2 / 20/220 / 0.1 / 0.1 / 0.1 L_{12} / 220 / 0.125 / 0.125 / 0.3 L_{13} / 220 / 0.15 / 0.15 / 0.35 L_{23} / 220 / 0.25 / 0.25 / 0.7125 The generators are running on no load at their rated voltages and rated frequency with their emf in phase. Calculate the fault current for the following faults. I. Line to Ground fault through fault impedance 0.1 pu. II. Double Line to ground fault through fault impedance0.1 pu. III. Make comment which is a more severe fault				
Q2.(b)	Determine the fault current for a line-to-ground (L-G) fault. Sketch an equivalent network showing the interconnection of sequence networks to simulate L-G fault.	8	1	3,4	4
Q3.(a)	Calculate the symmetrical component of currents of phase **'a'** in a three phase system, the original phasors of which are: **I_a=12+j6 A, I_b=12-j12 A** and **I_c=-15+j10 A.**	6	1	3,4	2
Q3.(b)	Sketch zero sequence for the following transformer configurations I. Delta connected primary and secondary II. Star with neutral isolated primary and star with neutral grounded secondary. III. Star connected primary and secondary IV. Primary star connected with neutral grounded through a resistance and secondary star connected neutral solidly grounded.	4	1	2	2
Q3.(c)	A three phase transmission line operating at 33 KV and having a resistance and reactance of 5Ω and 20Ω respectively is connected to a generating station busbar through a 15 MVA step up transformer which has a reactance of 0.06pu .Connected to the busbars are two generators, one 10 MVA having 0.1 pu reactance and another 5MVA having 0.075 pu reactance. Calculate the short circuit MVA and fault current when a three phase short circuit occurs at point P.	10	1	4	3

					
Q4.(a)	In the two bus system ,bus 1 is a slack bus with V_1=1.0. A load of 150 MW and 50 MW is taken from bus 2. The line admittance is Y_{12}=10 pu on the base of 100 MVA. The expression for the real and reactive power at bus 2 is given by =10 =-10 Using Newton Raphson obtain the voltage magnitude and phase angle at bus 2. Start with an initial estimate of=1 pu and . Perform one iteration. 	12	2	4	5
Q4.(b)	Develop the equation for real and reactive bus powers. Give classification of various type of buses in a power system for the load flow studies. Justify the classification.	8	2	2	5
Q5.(a)	Two large synchronous systems are interconnected by a transmission line over which there is power flow. Derive is equal angle criterion? Discuss the application of the equal angle criterion for the system stability when sudden increase in mechanical input to the generators takes place.	10	3	3,4	6
Q5.(b)	A loss free generator supplies 50 MW to an infinite bus , the steady state limit of the system being 100 MW. Determine whether the generator will remain in synchronism if the prime mover input is abruptly increased by 30 MW.	10	3	4	6
Q6.(a)	Derive the swing equation for a synchronous generator starting from the basic principle of dynamics, clearly stating the assumptions made. Explain how swing curves can be used to determine the transient stability of a power system following a fault.	10	3	3	6
.Q.6(b)	Explain the computational procedure for the load flow solution using Gauss Seidel method when system contains load buses and generator buses.	10	2	2	5
Q7.(a)	Discuss various methods for improving the transient stability limit of a power system.	10	4	2	5

Q7.(b)	Explain the concept of travelling waves on a long transmission line. Derive the expressions for the incident, reflected, and transmitted waves when a surge travels along a line.	10	4	2,3	7

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~~End Semester Examinations~~ /Re- Examinations - ~~November 2025~~/ January 2026

Program: T. Y(Electrical) Sem-V

Course Code: PC-BTE504

Course Name: Power System Analysis

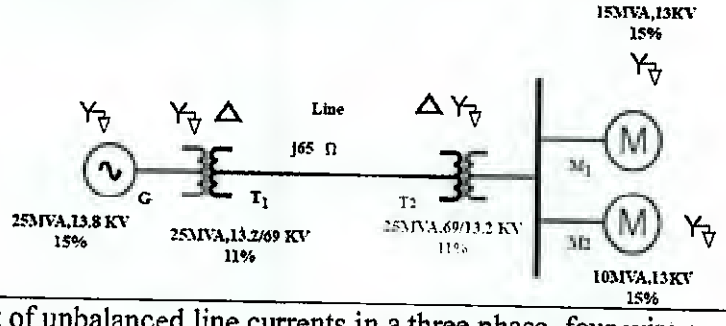
Duration: 3 h

Maximum Points: 100

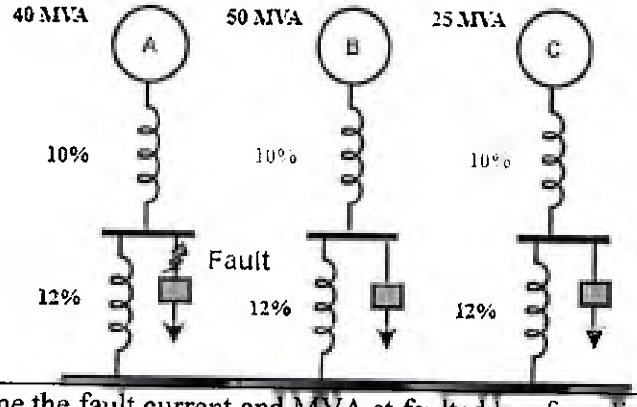
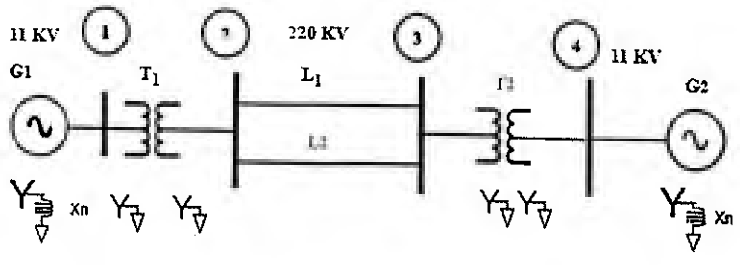
Semester: V

09/01/26

- Attempt any *five* questions.
- Make suitable assumptions wherever necessary.
- Answer should have four digits after decimal.

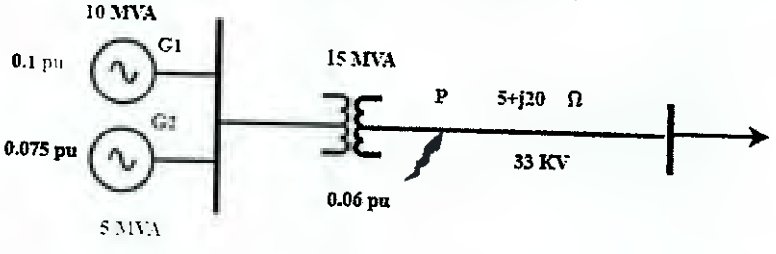
Q.No	Questions	Points	CO	BL	Module
Q1.(a)	A one line diagram of the system is shown below. Choose 13.8 KV, generator voltage as base voltage and 25 MVA as base MVA. Sketch per unit reactance diagram. 	6	1	2	1
Q1.(b)	.A set of unbalanced line currents in a three phase, four wire system is as follows: I_a=-j6 A, I_b=(-8+j5) A and I_c=7A. Determine the zero, positive and negative sequence components of phase 'a' the current.	6	1	3	2
Q1.(c)	For the power system network with the following data, sketch the interconnected system and compute the bus admittance matrix.	8	2	3,4	5

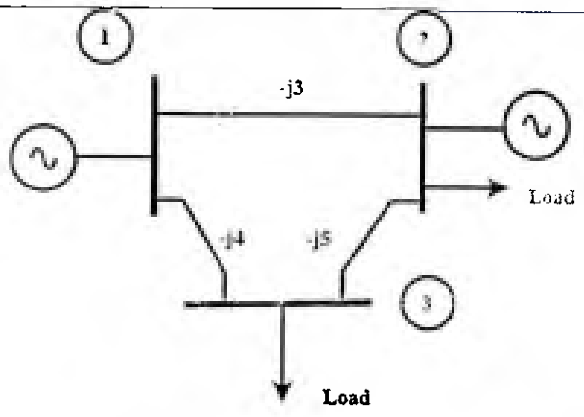
Bus code	Per unit line admittances
1-2	2-j8
2-3	0.666-j2.664
3-4	2-j8
1-3	1-j4
2-4	1-j4

Q2.(a)	Describe symmetrical components and demonstrate how can we represent unbalanced currents using the symmetrical components of current?	10	`1	1,2	2
Q2.(b)	A 30 MVA ,11KV,3-φ synchronous generator has a direct subtransient reactance 0.25 pu. The negative and zero sequence reactances are 0.35 and 0.1 pu respectively. The neutral of the generator is solidly grounded. Determine the subtransient current and the line –to-line voltages at the fault under subtransient conditions when double line to ground fault occur. Assume that the generator is unloaded and operating at rated terminal voltage when fault occurred.	10	1	4	4
Q3.(a)	Three 6.6 KV generators A,B and C ; each of 10% leakage reactance and MVA ratings 40,50 and 25 respectively are interconnected electrically as shown below by a tie bar through current limiting reactors each 12% reactance based upon the rating of the machine to which it is connected. A 3-φ feeder is supplied from the busbar of generator A at a line voltage of 6.6KV. The feeder has a reactance of 0.06 Ω/phase and an inductive reactance of 0.12 Ω/phase. Estimate the maximum MVA that can be fed into symmetrical short circuit at the far end of the feeder. 	10	1	4	3
Q3.(b)	Determine the fault current and MVA at faulted bus for a line to ground fault at bus 4 as shown below. 	10	1	4	4

G_1&G_2	100MVA	11KV	$X_1=X_2=15\%$	$X_o=5\%$	$X_n=6\%$
T_1 &T_2	100 MVA	11/220 KV	Leakage reactance $X_l=9\%$		
L_1 &L_2	100 MVA	$X_1=X_2=X_o=10\%$			

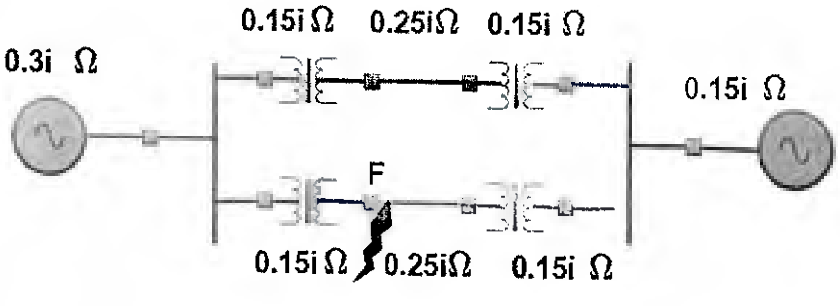
Consider a fault at 'a' phase.

Q4.(a)	Establish the relationship to determine the fault current for a line-to-line (L-L) fault. Sketch an equivalent network showing the interconnection of sequence networks to simulate L-L fault.	10	1	2,3	4
Q4.(b)	A three phase transmission line operating at 33 KV and having a resistance and reactance of 5Ω and 20Ω respectively is connected to a generating station busbar through a 15 MVA step up transformer which has a reactance of 0.06pu .Connected to the busbars are two generators, one 10 MVA having 0.1 pu reactance and another 5MVA having 0.075 pu reactance. Calculate the short circuit MVA and fault current when a three-phase short circuit occurs at the high voltage terminal of the transformer (at point P). 	10	1	4	3
Q5.(a)	Compare the Gauss Seidel and Newton Raphson methods for load flow study	8	2	3	5
Q5.(b)	A three bus power system is shown below. The relevant pu line reactances on 100 MVA base are indicated on the diagram and bus data is given in table below.	12	2	4	5



Bus Number	Type	Generation		Load		Bus Voltage
		P_G (MW)	Q_G(MVAR)	P_L(MW)	Q_L(MVAR)	
1	slack	?	?	0	0	1.02<0
2	**PQ**	25	15	50	25	?
3	**PQ**	0	0	60	30	?

Form Y_{bus} and find voltages at bus 2 and 3 after first iteration using Gauss Siedel method.

Q6.(a)	A generator connected to metropolitan system through high voltage lines, the reactance in per unit are indicated on the figure given below. Breaker adjacent to a fault (at point F) on both the side are arranged to clear simultaneously. Determine the critical clearing angle for the generator for a three -phase fault at the point P when the generator is delivering 1.0 per unit power. Assume that the voltage behind transient reactance is 1.2pu for the generator and that the voltage at the infinite bus is 1.0 per unit. Also determine the critical clearing time. 	12	3	4	6
Q6.(b)	Derive the swing equation for a synchronous generator starting from the basic principle of dynamics, clearly stating the assumptions made.	8	3	2	6

Q.7(a)	Starting from the swing equation $M\frac{d^2\delta}{dt^2} = P_m - P_e$ and assuming $P_e = \frac{EV}{X}\sin\delta$ .Derive the expression for small-signal oscillations of the rotor angle and discuss the concept of synchronizing power.	10	4	3	6
Q7.(b)	Explain what is meant by the surge impedance loading (SIL) of a transmission line. Derive the expressions for: (a) the surge impedance of a lossless transmission line, and (b) the velocity of propagation of an electric wave in terms of the line inductance and capacitance.	10	4	3	7

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END SEMESTER November 2025 / ~~RE – EXAM~~ January 2026

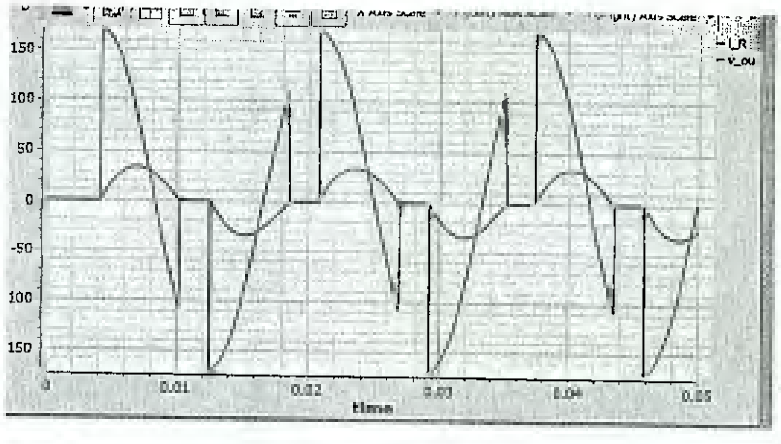
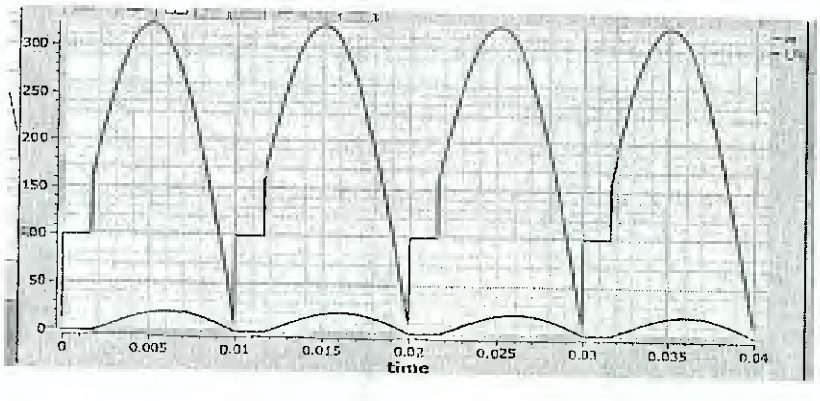
Program: Electrical Engineering Third year Ele
Duration: 3 hours

Course Code: PC-BTE 501
Maximum Points: 100

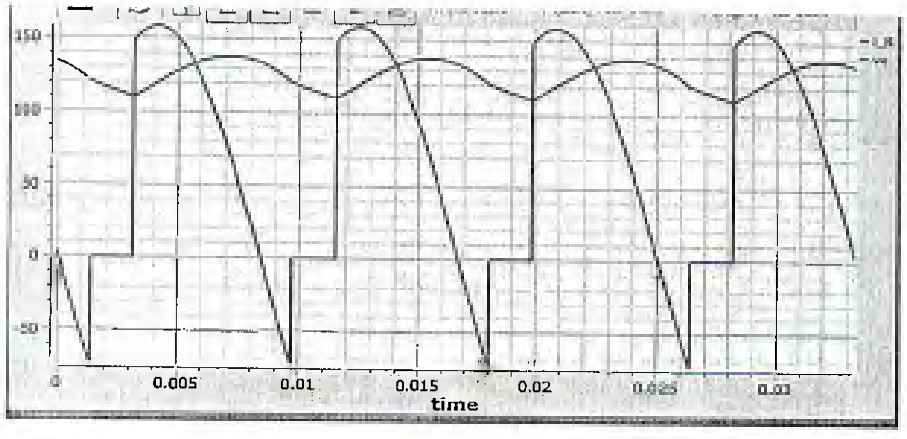
Course Name: Power Electronics
Semester: V

21/11/2025

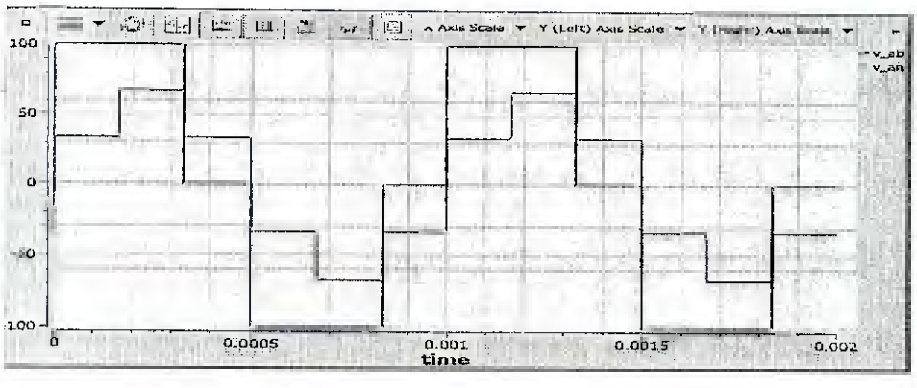
Notes: Question number 1 is compulsory; solve any 4 questions out of remaining 6

Q.No.	Questions	Marks	CO	BL	Module
Q1) A)	In power electronics laboratory following waveforms are observed on DSO. Identify (1 mark each) the circuit (across which DSO is connected) and justify answer (2 marks each) for each waveform. Waveform 1  Waveform 2  	15	1, 2, 3	3	3, 4, 6, 7

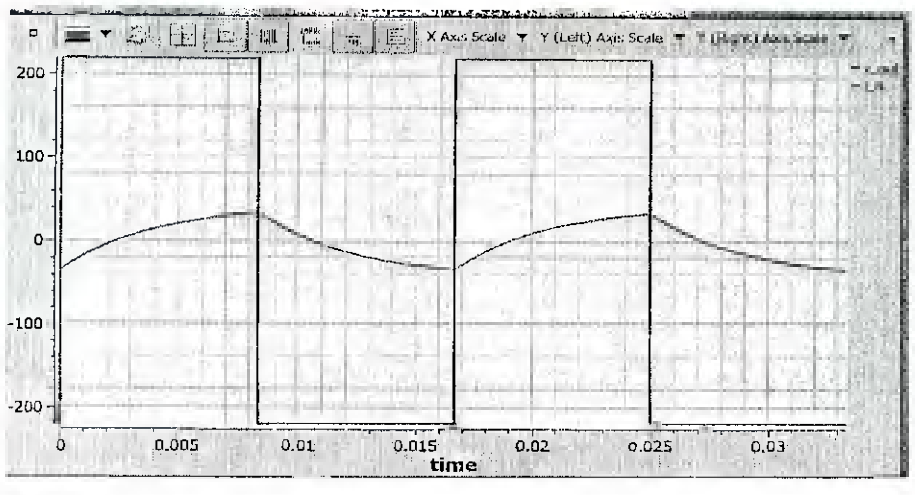
Waveform 3



Waveform 4



Waveform 5



Q1) B)	1. The free-wheeling diode connection is not required in the circuit of single phase FW uncontrolled rectifier with RL load. Justify this statement with appropriate waveforms.	5	2	3	3

END SEMESTER November 2025 / ~~RE – EXAM~~ January 2026

Q2) A)	Compare power electronics switches MOSET with IGBT on following points 1. Ratings 2. symbol 3. Switching frequency 4. Losses 5. Application	12	1	2	2
B)	A single phase full converter with RLE load having source voltage of 230 V and average load current of 10 A is continuous working range. For R= 0.4 ohm and L= 2 mH compute firing angle delay alpha in degrees for E= 120 V	8	2	3	3
Q3) A)	Derive average output voltage of three phase full-wave controlled rectifier (specify assumptions if any).	6	2	3	3
B)	A. Derive average output voltage of Single phase controlled full-wave rectifier with R-L load and free-wheeling diode connected across load with assumptions (if any)	4	2	3	3
	B. Draw output, input voltage and output current waveforms showing conducting switches of single phase full bridge voltage source inerter with 'L' load as well as single phase half bridge voltage source inverter for same load.	1,2, 2 1,2, 2	3	3	4
Q4)	Draw source voltage, triggering pulses to six switches, load phase voltages, load line voltages, and line load current of 'b' phase (showing conducting switch numbers) of three phase 180 degree conduction voltage source inverter for star connected R load. Derive load voltages (phase as well as line voltages) for every 60 degree conduction duration. Use maximum 2 graph papers.	1, 3, 3, 3, 4,6	3	3	4
Q5) A)	A boost converter has the following parameters Vin = 20 V; D = 0.6; L = 100 μH; R = 50 Ω; C = 100 μF; f = 15 kHz 1. The inductor current is.. 2. The output voltage (in V) is… 3. The maximum inductor current (A) is… 4. Comment on load current mode	12	3	3	6
B)	Derive critical or minimum inductor and capacitor for DC to DC converter to work it as a boost converter. Derive output voltage in terms of supply voltage.	8	3	3	6

Q6) A)	Discuss VSI connection to grid as Static VAR compensator.	8	3	3	4
B)	With the help of neat waveforms discuss switching characteristics of SCR.	12	1	3	1
Q7)	With the help of circuit diagram, explanation and waveforms, write short note on following topics				
	A. AC voltage controller with R-L load	10	3	3	7
	B. Filters used in rectifiers	10	3	3	5

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~~END SEMESTER November 2025~~ / RE - EXAM January 2026

Program: Electrical Engineering T.Y. B.Tech Sem V **Duration: 3 hours**

Course Code: PC-BTE 501 **Maximum Points: 100**

Course Name: Power Electronics **Semester: V**

06/01/26

Notes: Question number 1 is compulsory; solve any 4 questions out of remaining 6

Q.No.	Questions	Marks	CO	BL	Module
Q1) A)	Draw following mentioned waveforms with proper nomenclature				
	a) For circuit of single phase full-wave uncontrolled rectifier with R-L load draw output voltage, load current and source current waveforms	4	2	3	3
	b) For circuit of single phase full bridge voltage source inverter with R-L load draw source voltage, load voltage and load current waveforms	1, 1, 2	2	3	4
	c) For circuit of boost converter draw inductor voltage and inductor current waveforms	3	3	3	6
	d) For single phase voltage controller with R-L load draw output voltage and current for $\alpha>\varphi$	4	2	3	7
	e) For circuit of single phase full-wave controlled converter with R-L-E continuous current load draw output voltage, load current and source current for $\alpha=120^0$.	2,1, 2	1	3	3
Q2) A)	Compare power electronics switches MOSET with IGBT on following points 1. Ratings 2. symbol 3. Switching frequency 4. Losses 5. Application	12	1	2	2
B)	A single phase fully controlled bridge rectifier is connected to RLE load is supplied from 230 V, 50 Hz ac supply. The average load current is 5 A which is constant over the working range. Determine the firing angle of for E= 100 V. Assume R=4 ohm and L= 5 mH.	8	2	3	3
Q3) A)	Explain Sinusoidal PWM triggering technique used in VSI inverters using following points: Necessity, Modulating wave, Carrier wave,	10	3	3	4

	Frequency modulation index, Amplitude modulation index, Output voltages				
B)	Derive the expression for average dc output voltage for three phase full wave fully controlled rectifier. Plot the variation of average dc voltage output of rectifier as a function of firing angle.	10	3	3	6
Q4)	Draw source voltage, triggering pulses to six switches, load phase voltages, load line voltages, and line load current of 'b' phase (showing conducting switch numbers) of three phase 180 degree conduction voltage source inverter for star connected R load. Derive load voltages (phase as well as line voltages) for every 60 degree conduction duration. Use maximum 2 graph papers.	1, 3, 3, 3, 4,6	3	3	4
Q5) A)	The buck dc to dc circuit has following parameters Vs= 50 V, D = 0.4, R = 20 Ω, L = 400 μH, C = 100 μF, f= 20 kHz Determine the output voltage, inductor current average, maximum and minimum values and the output voltage ripple and comment on load current mode.	8	3	3	6
B)	With the help of source voltage, load voltage, inductor voltage, capacitor voltage, inductor current, capacitor current and load current waveforms derive buck DC to DC converter's output voltage relation with input voltage, critical/ minimum inductor and capacitor value for continuous load current and constant output voltage mode of operation.	12	3	3	6
Q6) A)	Discuss switching characteristics of SCR.	10	1	3	1
B)	With the help of circuit diagram, change in waveforms, discuss filter connection across rectifiers.	10	3	3	5
Q7)	Draw output voltage (specify voltages) pulses, triggering pulses, source currents waveforms of each phase, output current (specify conducting switches) waveform of three phase controlled rectifier when delay angle is set to 90° for R load and justify every waveform and pulses. To draw waveforms and pulses use only 1 graph paper and justification should be written on answer-book.	4, 2, 6, 4, 4	2	3	3

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End Semester 2025 Examinations

~~November~~ Dec Minor 02

Human Resource Management

SET 1

Program: CME Third year Ele-Sem V

Course Code: MI BT 502

Course Name: Human Resource management

Duration: 03 hours

Maximum Points: 100

Semester: V

03/12/2025

NOTE:

- **Question No. 1 is compulsory.**
- **Attempt five questions from the remaining six.**
- **All questions carry equal marks as indicated.**
- **Illustrate your answers with examples and suitable diagrams wherever necessary.**

Sr.no	Question	Point	BL	Module
Q.1. A	**Case:** Tech Nova Pvt. Ltd., a fast-growing IT company, faced a high turnover rate among software engineers. The HR department identified issues in the recruitment and selection process. The company relied heavily on employee referrals and social media for recruitment but did not have a structured selection process. Interviews were often unstructured, and job descriptions were outdated. Consequently, new hires often left within six months citing "job-role mismatch" and "lack of clarity about expectations." As the HR Manager, you have been asked to design a new recruitment and selection policy to address these issues. **Questions:** 1. Identify and explain the problems in Tech Nova's current recruitment and selection system. (4 Marks) 2. Suggest improvements in the recruitment sources and selection methods to ensure better employee fit. (4 Marks) 3. Draft a brief recruitment policy outlining the major steps and principles you will implement. (4 Marks)	12	03	02,4
Q.1. B	With the help of a diagram describe the determinants of HR planning.	08	01	01

Q.2. A	Explain the process and methods of Human Resource Planning.	12	02	02
Q.2. B	Discuss job analysis and job design and their importance in effective HRM.	08	02	02
Q.3. A.	Discuss the need, importance, and objectives of training and development in an organization.	12	01	03
Q.3 B.	Explain the methods of training and distinguish between training, development, and education with examples.	08	02	03
Q.4. A	Explain the process and methods of job evaluation. How does it help in wage determination?	12	01	04
Q.4. B	Discuss the types of wages and fringe benefits commonly used in Indian industries.	08	03	04
Q.5. A	Explain the types and principles of promotion. Compare seniority-based and merit-based promotions.	12	01	05
Q.5. B	Discuss the methods and process of performance appraisal. How does potential appraisal complement performance appraisal?	08	01	05
Q.6. A	*"Employee Relations is shifting from a control-oriented approach to a commitment-oriented approach."* Discuss this statement in detail. In your answer, explain the evolution of employee relations, key principles of modern employee relations management, and the role of HR in fostering a positive employee relations climate.	12	03 ,0 4	07
Q.6. B	Explain the major causes of employee grievances and outline the steps involved in a formal grievance-handling procedure. How does an effective grievance mechanism contribute to better employee relations?	08	02	07
Q.7. A	**Case:** Global Motors Ltd., a manufacturing company, recently faced unrest among workers due to dissatisfaction with working conditions and lack of communication between management and employees. Employees complained about biased promotions and poor grievance redressal. The HR department realized that the company had not updated its employee relations policies for years and lacked a structured communication mechanism between management and labor representatives. **Questions:** 1. Identify the key issues in employee relations management faced by Global Motors Ltd. **(4 Marks)** 2. Suggest tools and techniques the HR department can use to improve employee relations and build trust. **(4 Marks)** 3. Discuss how effective employee relation management contributes to productivity and organizational harmony. **(4 Marks)**	12	04	07
Q.7. B	**Multiple choice Questions:** 1. **A company faces frequent employee absenteeism and low morale. Which approach would BEST help management rebuild trust and improve relations?**	08	04	07

A. Strict disciplinary action
B. Open communication forums and participative decision-making
C. Increased supervision
D. Reduction in salaries

2.Employee Relations primarily focuses on which of the following

A) Financial Management
B) Relations between employers and employees
C) Marketing and Sales
D) Production Planning

3.Which Act governs the settlement of Industrial disputes in India?

A) Industrial Employment Act, 1946
B) Industrial Disputes Act, 1947
C) Trade Unions Act, 1926
D) Factories Act, 1948

4. In an Organisation, employees complain about favoritism in promotions. Which HR tool is the most effective in this situation?

A) Job rotation
B) Transparent performance appraisal system
C) Flexible working hours
D) Employee welfare committees

5.Collective bargaining is a process involving:

A) Individual negotiations between employee and HR manager
B) Negotiations between management and a group of employees (or union)
C) Government and employer
D) Customers and sales executives

6. A New HR manager introduces a "Zero tolerance policy". What is the key success factor for such policy?

A) Limiting employee communication channels
B) Encouraging fear of complaint
C) Building transparent feedback and resolution systems
D) Restricting union activities

7. Which of the following reflects strategic employee relations in a multinational company?

A) Using ER only to handle disputes
B) Aligning employee relations policies with global HR strategy and culture
C) Delegating ER solely to line managers
D) Avoiding local labor unions

8. A supervisor constantly ignores employee suggestions, leading to frustration. What long-term effect might this have on Employee Relations?

A) Increased motivation
B) Improved discipline
C) Decreased engagement and higher turnover
D) Higher productivity

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Reexam ~~End-Semester 2025~~ **Examinations**
Jan 2026 ~~November~~ **Minor 02**
Human Resource Management
SET II

13/01/26

Program: CME
Course Code: MI BT 502
Course Name: Human Resource management

Duration: 03 hours
Maximum Points: 100
Semester: V

NOTE:

- **Question No. 1 is compulsory.**
- **Attempt five questions from the remaining six.**
- **All questions carry equal marks as indicated.**
- **Illustrate your answers with examples and suitable diagrams wherever necessary.**

Sr.no	Question	Point	BL	Module
Q.1.A	**Read the following situation carefully and answer the questions that follow:** GlobalTech Pvt Ltd., a growing IT company, is facing high employee turnover and performance inconsistency. The HR department is planning to redesign its HR strategy focusing on better job analysis, recruitment, training, compensation and appraisal systems. a. Identify and explain the major HRM functions that should be improved at Global Tech. b. Suggest methods of Human Resource planning and Manpower forecasting suitable for the firm. c. Discuss how training and development can address performance issues. d. Recommend approaches to recruitment and selection that fit the organization's culture and needs. e. Outline measures to strengthen employee relations and retention.	20	04	1,2,3,4,5,6,7
Q.2.A	Read the case and answer the questions: Orion Auto Components Ltd. is a 25-year-old mid-sized manufacturing company supplying parts to major automobile manufacturers in India. The company employs 620 workers and 80 managerial/technical staff. For years, Orion operated in a stable market, but with increasing competition and the rise	20	02	02

	of electric vehicles (EVs), the company now faces major changes. Several clients are demanding lighter components, higher precision, and faster delivery. **Current HR Situation** A recent internal audit revealed serious workforce-related challenges: • **Aging workforce:** 45% of machine operators are above 50 years old, and many will retire within 5–7 years. • **Skill gaps:** The company lacks technicians trained in CNC programming, automation, and quality analytics—skills essential for EV-compatible components. • **High turnover:** Younger employees leave within 2–3 years due to limited career growth and training opportunities. • **No formal succession plan:** Three senior managers in production and quality are expected to retire within the next three years, but no successors have been identified. • **Training budget constraints:** The annual training budget has remained constant for five years despite rising skill demands. • **Expansion plans:** Orion plans to start a new production line for EV components within two years, requiring an additional 120 skilled employees. • **Strategic Challenge** The Managing Director has asked the HR Head to prepare a **comprehensive HRM plan** that ensures Orion has the right number of people, with the right skills, at the right time. The HR Head must integrate manpower forecasting, recruitment strategy, skill development, retention planning, and succession management. Questions: 1. Identify the major HR planning challenges faced by Orion Auto Components Ltd. 2. Recommend a structured HRM planning approach to address Orion's future manpower and skill requirements. 3. What strategies should the HR department adopt for succession planning and retention of younger employees? 4. How can Orion redesign its training and development strategy to prepare for EV-related technological changes?			
Q.3.A.	Discuss the need, importance, and objectives of training and development in an organization.	12	01	03
Q.3 B.	Explain the methods of training and distinguish between training,	08	02	03

	development, and education with examples.			
Q.4.A	Explain the process and methods of job evaluation. How does it help in wage determination?	12	01	04
Q.4.B	Discuss the types of wages and fringe benefits commonly used in Indian industries.	08	03	04
Q.5. A	Explain the types and principles of promotion. Compare seniority-based and merit-based promotions.	12	01	05
Q.5.B	Discuss the methods and process of performance appraisal. How does potential appraisal complement performance appraisal?	08	01	05
Q.6.A	Define compensation management and explain its objectives and process.	12	03	06
Q.6.B	Discuss the systems of wage payment and the concept of profit-sharing and co-partnership schemes.	08	01	06
Q.7. A	Case: Global Motors Ltd., a manufacturing company, recently faced unrest among workers due to dissatisfaction with working conditions and lack of communication between management and employees. Employees complained about biased promotions and poor grievance redressal. The HR department realized that the company had not updated its employee relations policies for years and lacked a structured communication mechanism between management and labor representatives. **Questions:** 4. Identify the key issues in employee relations management faced by Global Motors Ltd. **(4 Marks)** 5. Suggest tools and techniques the HR department can use to improve employee relations and build trust. **(4 Marks)** 6. Discuss how effective employee relation management contributes to productivity and organizational harmony. **(4 Marks)**	12	04	07
Q.7.B	**Multiple choice Questions:** **1. A company faces frequent employee absenteeism and low morale. Which approach would BEST help management rebuild trust and improve relations?** A) Strict disciplinary action B) Open communication forums and participative decision-making C) Increased supervision D) Reduction in salaries **2.Employee Relations primarily focuses on which of the following** A) Financial Management B) Relations between employers and employees C) Marketing and Sales D) Production Planning **3.Which Act governs the settlement of Industrial disputes in India?** A) Industrial Employment Act, 1946 B) Industrial Disputes Act, 1947 C) Trade Unions Act, 1926 D) Factories Act, 1948	08	04	07

4. In an Organisation, employees complain about favoritism in promotions. Which HR tool is the most effective in this situation?

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End Sem ~~November~~ Dec 2025

Program: Electrical Engineering Third year Ele

Course Code: ~~MI-BT042~~

Course Name: Microcontroller and Embedded System

Duration: 3 Hr

Maximum Points: 100

Semester: V

03/12/2025

Instructions:

1. Question 1 is compulsory.
2. Attempt any FOUR from the remaining questions (Q.2 to Q.7).
3. All questions carry 20 marks.
4. Assume suitable data if necessary.

Q. No.	Questions	Points	CO	BL	Module No.
Q.1	**a.** Explain the function of the following AVR Status Register (SREG) flags with an example for each: (i) Zero Flag (Z) (ii) Carry Flag (C) (iii) Overflow Flag (V) (iv) Sign Flag (S) (v) Global Interrupt Enable (I).	5	2	2	2, 3
	b. Classify the AVR microcontroller families (Tiny, Mega, etc.) and state two key features and one typical application for each family.	5	2	2	2
	c. Write an AVR C program to configure Port B as an output and blink an LED connected to Pin 2 with a 100ms delay.	5	2	3	3, 4
	d. What is an Opto-isolator? Why is it recommended for interfacing a microcontroller with an AC load like a relay?	5	3	2	6
Q.2	**a.** Design a block diagram for a Smart Home Security System using a Raspberry Pi as the main controller. The system includes a PIR motion sensor, a magnetic door sensor, a siren, and a Wi-Fi module for sending alerts.	10	1	4	6, 7
	b. Explain the I/O Direct and Direct addressing modes in AVR. Write assembly instructions to (i) read the value from Port C into R20, and (ii) store the value from R20 into SRAM address 0x250.	10	2	3	2, 4
Q.3	**a.** An LM35 temperature sensor is connected to ADC channel 0 of an ATmega32. Write an AVR C program to read the analog temperature value and display the digital value on Port B.	10	3	3	4, 5
		10	2	4	5

End Sem November 2025

	b. With the help of a timing diagram, explain how the USART in AVR performs asynchronous serial data transmission of a byte 0x4D with 1 start bit, 8 data bits, and 1 stop bit.				
Q.4	**a.** Draw the interface circuit for an AVR microcontroller to control a 12V DC motor using an NPN transistor and a relay. Include the necessary protection diode.	10	I	3	6
	b. Write an AVR assembly program to create a 1-second delay using the Timer1 module in Normal mode with a prescaler. Assume a 16MHz crystal.	10	2	3	5
Q.5	**a.** Write a Python program for a Raspberry Pi to read a toggle the LED connected to GPIO pin 25.	10	3	3	6, 7
	b. Explain the concept of Prescaling in AVR Timers. Calculate the value to be loaded into TCNT0 to generate a time delay of 1ms using Timer0 in Normal mode. (CPU Freq = 8MHz, Prescaler = 64).	10	2	3	5
Q.6	**a.** Propose a block diagram for a line-following robot. Identify the sensors, actuators, and the control logic performed by the microcontroller.	10	1	4	7
	b. Explain the function of the following AVR instructions: LDI, ADD, STS, BRNE. Identify the addressing mode used in each instruction.	10	2	2	3
Q.7	**a.** Explain in detail the operation of the following AVR instructions and discuss their effect on the Status Register (SREG): EOR R16, R17, LSL R18, BRLO label. Your answer should clearly describe the purpose of each instruction, how it manipulates data, and how the corresponding flags in the SREG are affected.	10	2	2	3
	b. Raspberry Pi blurs the line between a microcontroller and a microcomputer. Justify this statement by comparing its architecture and capabilities with a traditional 8-bit AVR microcontroller.	10	4	4	1, 6

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Reexam January 2026

~~End Sem November 2025~~

Program: Electrical Engineering T.Y.B Tech - Ele Sem - V **Duration: 3 Hr**

Course Code: MI-BT042 **Maximum Points: 100**

Course Name: Microcontroller and Embedded System **Semester: V**

13/01/26

Instructions:

1. Question 1 is compulsory.
2. Attempt any FOUR from the remaining questions (Q.2 to Q.7).
3. All questions carry 20 marks.
4. Assume suitable data if necessary.

Q. No.	Questions	Points	CO	BL	Module No.
Q.1	**a.** Differentiate between a microprocessor and a microcontroller based on architecture, components, and application domains. Provide a block diagram for each to support your answer.	5	1	2	1
	b. Explain the function of the following AVR Status Register (SREG) flags with an example for each: (i) Zero Flag (Z) (ii) Carry Flag (C) (iii) Overflow Flag (V) (iv) Sign Flag (S) (v) Global Interrupt Enable (I).	5	2	2	2, 3
	c. Write an AVR C program to configure Port B as an output and blink an LED connected to Pin 2 with a 500ms delay.	5	2	3	3, 4
	d. List and briefly explain any five key features of the Raspberry Pi that make it suitable for embedded system prototyping.	5	4	1	6
Q.2	**a.** Draw and explain the block diagram of a generic embedded system for a robotic arm control, highlighting the role of the microcontroller and all connected peripherals (sensors, actuators, communication modules).	10	1	3	1
	b. Explain the Immediate and Indirect with Auto-increment addressing modes of the AVR with a suitable assembly code example for each.	10	2	3	2, 3
Q.3	**a.** Write an AVR assembly program to add two 16-bit numbers stored in R25:R24 and R23:R22. Store the 16-bit result in R21:R20.	10	2	3	3
	b. Compare and contrast the Polling and Interrupt methods of	10	3	4	5

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	handling peripheral events in a microcontroller. List the steps an AVR takes when an interrupt occurs.				
Q.4	**a.** Design the hardware block diagram for an Automatic Plant Watering System using an AVR microcontroller. The system uses a soil moisture sensor and controls a water pump via a relay.	10	1	4	1, 6
	b. A switch is connected to pin PB0 and an LED to pin PB7. Draw the circuit and write a program to get the status of switch (SW) and send it to the LED.	10	2	3	5
Q.5	**a.** Interface a DHT11 digital temperature and humidity sensor with an AVR microcontroller. Write a C program function to read the temperature value.	10	3	3	6
	b. Explain the role of the MAX232 IC in serial communication. Draw a schematic showing the connection between an AVR, MAX232, and a PC's DB-9 connector for a full-duplex UART link.	10	4	3	5
Q.6	**a.** Draw a detailed hardware interface diagram for controlling a 5V, 2-phase bipolar stepper motor using an AVR microcontroller and an L293D motor driver IC.	10	1	3	6
	b. Explain in detail the operation of the following AVR instructions and discuss their effect on the Status Register (SREG): *EOR R16, R17, LSL R18, BRLO label.* Your answer should clearly describe the purpose of each instruction, how it manipulates data, and how the corresponding flags in the SREG are affected.	10	2	2	3
Q.7	**a.** Write a Python program for a Raspberry Pi to read a push button connected to GPIO pin 17 and show its status.	10	3	3	6, 7
	b. Discuss the advantages and limitations of using a 32-bit microcontroller over an 8-bit microcontroller (like AVR) for advanced robotics applications.	10	4	4	1

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END SEMESTER November 2025 / ~~RE-EXAM January 2026~~

Program: T. Y. B. Tech Electrical Sem V

Course Code: PC-BTE 503

Course Name: Electrical Machines II

Duration: 3 Hours

Maximum Points: 100

Semester: V

26/11/2025

Instructions:

1. **Question no. 1 is compulsory.**
2. Attempt **any FOUR** from remaining 6 questions.
3. Draw neat diagrams wherever possible.

Q.No.	Questions	Points	CO	BL	Module No.
Q1.	Explain the following in brief. (a) No-load and blocked rotor test on 3-phase induction motor (b) V-curves of synchronous motor (c) Hunting effect (d) Power angle characteristics of cylindrical rotor synchronous machine.	05 05 05 05	01	L-1	01 03
Q2 (a)	Explain why slip in a 3-phase induction motor is directly proportional to torque when operating near synchronous speed. Hence, draw and explain the torque/speed (slip) characteristics of 3-phase induction motor.	02+08	01	L-1	01
Q2 (b)	A 60 kW, 400V, 3-phase, 6-pole, and 50 Hz wound rotor induction motor has a full-load slip of 0.04 when operating at rated voltage and frequency with rotor winding short circuited at slip rings. The slip at maximum torque is 0.2. Stator resistance and mechanical losses are neglected. Determine (a) the maximum torque and (b) full-load rotor ohmic losses.	10	01	L-1	01
Q3 (a)	Why the synchronous motor is not self-starting? Hence, explain the different methods of starting synchronous motor. **(Any Two)**	02+03 +03	02	L-1	03
Q3 (b)	A 6.6 kV, 3-phase, 50 Hz, star-connected alternator gave the following data for open circuit, short circuit and full-load zero-power factor tests:	12	02	L-1	02

I_f (A)	3.2	5.00	7.50	10.00	14.00

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END SEMESTER November 2025 / ~~RE – EXAM January 2026~~

	E_f(kV)	3.10	4.90	6.60	7.50	8.24			
	I_{sc} (A)	500	778	1170	---	---			
	Per phase armature resistance is 0.2 Ω. Calculate the voltage regulation at full load current of 500 A at 0.8 p.f. lagging by EMF and MMF method. Comment on the result.								
Q4 (a)	Derive the condition for maximum power output for a synchronous generator with the help of phasor diagram; hence obtain the expression for maximum power output from a generator.						05+05	02	L-1	03
Q4 (b)	A 3-phase star-connected alternator has synchronous impedance of 1+j10 Ω per phase. It is operating at a constant voltage of 6.6 kV and its field current is adjusted to give an excitation voltage of 6.4 kV. Find the power output, armature current and power factor under the conditions of maximum power output.						10	02	L-1	03
Q5 (a)	Explain the operation on infinite bus bar for change in excitation for synchronous motors. Hence, explain the different modes of excitation with phasor diagram.						02+06 +02	02	L-1	04
Q5 (b)	A 400V, 3-phase mesh-connected synchronous motor runs at rated voltage and with an excitation e.m.f. of 510V. Its synchronous impedance per phase is (0.5+j4) Ω and friction, windage and iron losses are 900 W. Calculate the shaft power output, line current, power factor and efficiency for maximum power input condition.						10	02	L-1	04
Q6 (a)	Explain Blondel's two reaction model for salient pole synchronous machine with phasor diagram.						06+04	02	L-1	05
Q6 (b)	Explain the construction and working principle of operation of single phase induction motor with neat diagram.						04+04 +02	03	L-1	06
Q7 (a)	Explain the construction and working principle of operation of brushless DC (BLDC) motor with neat diagram.						04+04 +02	03	L-1	07
Q7 (b)	Explain the construction and working principle of operation of switched reluctance motor with neat diagram.						04+04 +02	03	L-1	07

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~~END SEMESTER November 2025~~ / RE - EXAM January 2026

Program: T. Y. B. Tech Electrical Sem-V

Course Code: PC-BTE 503

Course Name: Electrical Machines II

Duration: 3 Hours

Maximum Points: 100

Semester: V

12/01/26

Instructions:

1. **Question no. 1 is compulsory.**
1. Attempt **any FOUR** from remaining 6 questions.
2. Draw neat diagrams wherever possible.

Q.No.	Questions	Points	CO	BL	Module No.
Q1 (a)	Explain the following in brief. (a) V-curves of synchronous motor (b) Concept of synchronizing power and torque (c) No load and blocked rotor test on 3-phase induction motor. (d) Synchronous condenser	 05 05 05 05	01	L-I	01 03
Q2 (a)	A 3-phase, 4-pole, 1440 rpm., 50 Hz induction motor has star-connected rotor winding, having a resistance of 0.2Ω per phase and a standstill leakage reactance of 1Ω per phase. When the stator is energized at rated voltage and frequency, the rotor induced emf at standstill is 120V per phase. (a) Calculate the rotor current, rotor power factor and torque both at starting and at full load and compare these results. (b) If an external resistance of 1Ω per phase is inserted in rotor circuit, calculate rotor current, rotor power factor and torque at the time of starting.	06 04	01	L-1	01
Q2 (b)	Explain why slip in a 3-phase induction motor is directly proportional to torque when operating near synchronous speed. Hence, draw and explain the torque/speed (slip) characteristics of 3-phase induction motor.	02+08	01	L-1	01

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~~END SEMESTER November 2025~~ / RE - EXAM January 2026

<table>
<tr><td>Q3 (a)</td><td>What is the hunting in case of synchronous machines? Hence, explain the causes of hunting, it's bad effects and how to avoid these effects.</td><td>02+02
+02+02</td><td>02</td><td>L-1</td><td>03</td></tr>
<tr><td>Q3 (b)</td><td>A 6.6 kV, 3-phase, 50 Hz, star-connected alternator gave the following data for open circuit, short circuit and full-load zero-power factor tests:
<table><tr><td>I_f (A)</td><td>3.2</td><td>5.00</td><td>7.50</td><td>10.00</td><td>14.00</td></tr><tr><td>E_f(kV)</td><td>3.10</td><td>4.90</td><td>6.60</td><td>7.50</td><td>8.24</td></tr><tr><td>I_{sc} (A)</td><td>500</td><td>778</td><td>1170</td><td>---</td><td>---</td></tr></table>Per phase armature resistance is 0.2 Ω. Calculate the voltage regulation at full load current of 500 A at 0.8 p.f. lagging by EMF and MMF method. Comment on the result.</td><td>12</td><td>02</td><td>L-1</td><td>02</td></tr>
<tr><td>Q4 (a)</td><td>Derive the condition for maximum power input to a synchronous generator with the help of phasor diagram; hence obtain the expression for maximum power input to a generator.</td><td>05+05</td><td>02</td><td>L-1</td><td>03</td></tr>
<tr><td>Q4 (b)</td><td>A 3-phase star-connected alternator has synchronous impedance of 1+j10 Ω per phase. It is operating at a constant voltage of 6.6 kV and its field current is adjusted to give an excitation voltage of 6.4 kV. Find the power output, armature current and power factor under the conditions of maximum power input.</td><td>10</td><td>02</td><td>L-1</td><td>03</td></tr>
<tr><td>Q5 (a)</td><td>Explain the operation on infinite bus bar for change in excitation for synchronous motors. Hence, explain the different modes of excitation with phasor diagram.</td><td>02+06
+02</td><td>02</td><td>L-1</td><td>04</td></tr>
<tr><td>Q5 (b)</td><td>A 400V, 3-phase mesh-connected synchronous motor runs at rated voltage and with an excitation e.m.f. of 510V. Its synchronous impedance per phase is (0.5+j4) Ω and friction, windage and iron losses are 900 W. Calculate the shaft power output, line current, power factor and efficiency for maximum power output condition.</td><td>10</td><td>02</td><td>L-1</td><td>04</td></tr>
</table>

~~END SEMESTER November 2025~~ / RE - EXAM January 2026

Q6 (a)	How to estimate direct and quadrature axis reactance of a salient-pole synchronous machine? Hence, explain the test/method to determine direct and quadrature axis reactance in detail with diagram.	01+09	02	L-1	05
Q6 (b)	Explain the construction and working principle of operation of single phase induction motor with neat diagram.	04+04 +02	03	L-1	06
Q7 (a)	Explain the construction and working principle of operation of synchronous reluctance motor with neat diagram.	04+04 +02	03	L-1	07
Q7 (b)	Explain the construction and working principle of operation of permanent magnet synchronous motor with neat diagram.	04+04 +02	03	L-1	07

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Munshi Nagar, Andheri (W) Mumbai – 400058

End/~~Re-Exam~~ Nov 2025

Program: T.Y. B.Tech. Ele Sem-V **Duration: 3 Hours**

Course Code: PC-BTE502 **Maximum Points: 100**

Course Name: Control System-I (R23) **Semester: V**

24/11/2025

Notes:
1. Question No. 1 is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Solve any **FOUR** from the following.				
a)	**Fig. 1** shows an automatic tank-level control system. List out the components of Control System and Actual system (Plant).	05	1	1,2	1
b)	Define the following terms. (a) Peak Overshoot, (b) Settling time and (c) Rise Time (d) BIBO Stability and (e) Asymptotic Stability	05	1,2	1,2	2
c)	Write Evans conditions. Explain magnitude and angle criterion.	05	1,2	1,2,3	3
d)	Write Nyquist Stability Criterion. Define Gain and Phase Margin	05	1,3	1,2,3	5
e)	Discuss time and frequency domain control system design specifications.	05	1,3	2,3	6
2. a)	Find the closed loop transfer function for the system shown in **Fig. 2** by using block diagram algebra.	10	1,2	2,3	1
b)	Consider the armature controlled d.c. motor shown in **Fig.3** . In this system , R_a - Resistance of Armature (ohm); L_a - inductance of armature winding (H); i_a - armature current (A); i_f - field current (A); e_a - applied armature voltage (V); e_b - back emf(V); T_M - torque developed by motor (Nm); θ - angular displacement of motor-shaft (rad); J - equibvlaent moment of inertia of motor and load referred to motor shaft (kg-m^2); fo - equivalent viscous friction coefficent of motor and load referred to motor shaft. Derive the transfer function $G(s) = \theta(s)/E_a(s)$ and also draw the complete block diagram for the same.	10	1	2,3	1

End/~~Re-Exam~~ 2025

3. a)	Give an example of manual Control System and suggest a solution to modify it to automatic Control system.	03	1	1,2	1
b)	Determine the value of the gain 'k' for the system, with the characteristics equation given below, to be stable. $s^3+2ks^2+(k+2)s+4=0$	07	1,2	2,3	2
c)	Measurements conducted on a servomechanism shows the system response to be $c(t)= 1+ 0.2e^{-60t} - 1.2 e^{-10t}$ when subjected to a unit step input. Obtain the expression for the closed loop transfer function.	10	1,2	2,3	2
4. a)	Obtain the overall transfer function C/R from the signal flow graph shown in **Fig. 4.**	10	1,2	1,2	2
b)	Sketch the root locus of a unity feedback system with an open loop transfer function $G(s)=\frac{K}{s(s+2)(s+4)}$ Find the range of values of K for which the system has damped oscillatory response.	10	1,2	2,3	3
5. a)	Draw the polar plot for the transfer function $G(s)=\frac{1}{s(s+20)}$ Show the effect of modification to the above transfer function on the polar plot if one more pole is added at **s = -40.**	06 04	1,3	1,2,3	5
b)	Sketch the Bode plots for the transfer function given below. $G(s)=\frac{10}{s(1+0.5s)(1+0.01s)}$ Determine the gain crossover and phase crossover frequencies.	10	1,3	2,3	5
6.	A unity feedback system with forward transfer function $G(s)=\frac{K}{s(s+7)}$ is operating with a closed loop step response that has 15% overshoot. Do the following; a. Evaluate the steady state error for a unit ramp input. b. Design a lag compensator to improve the steady state error by a factor of 20.	20	1,2	2,3,4	4,6

7.	Consider the unity feedback system with $$G(s)=\frac{K}{s(s+5)(s+20)}$$ The uncompensated system has about **55%** overshoot and a peak time of **0.5 sec.** when **Kv = 10.** Using frequency response method design a lead compensator to reduce the peak overshoot to **10%**, while keeping peak time and steady state error about the same or less..	20			

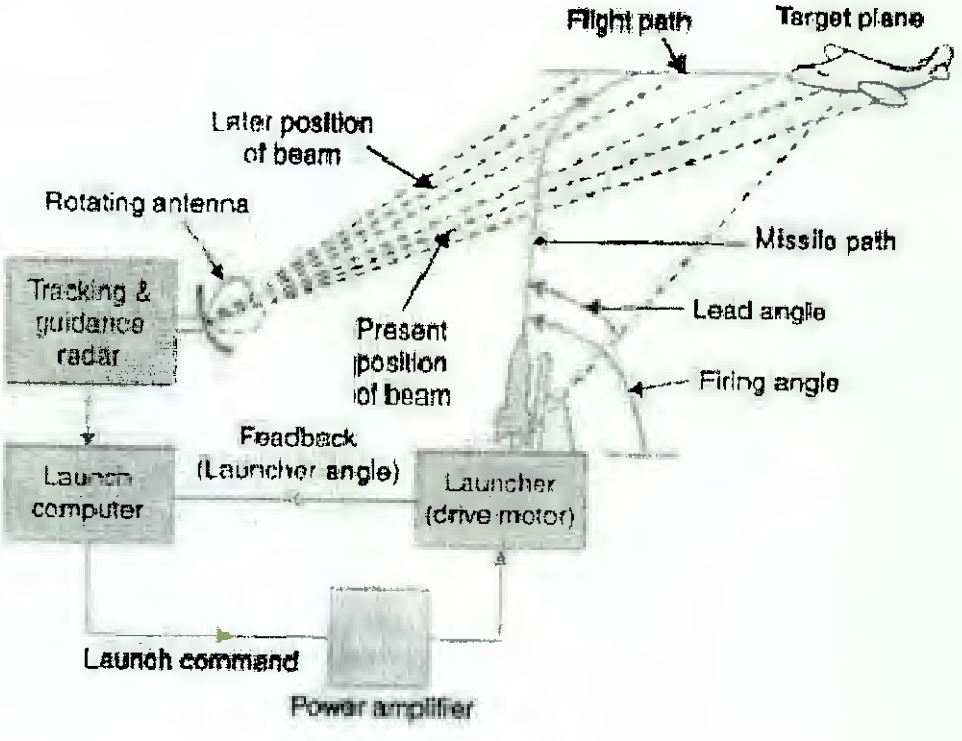

Fig. 1

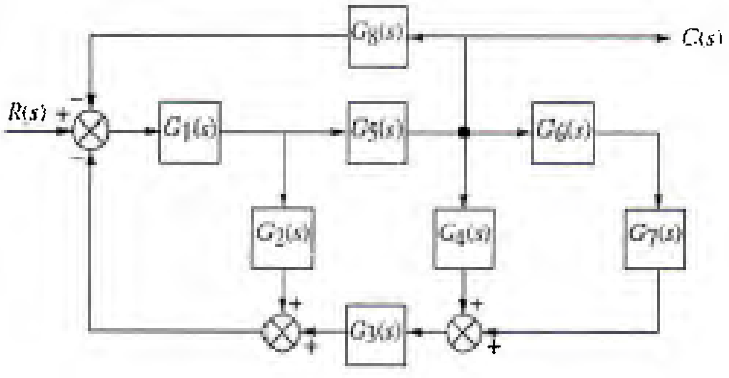

Fig. 2

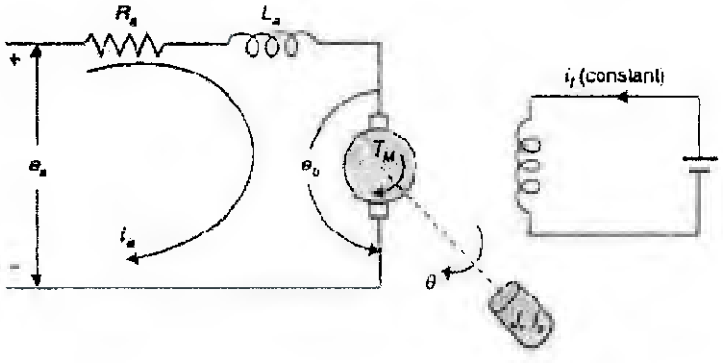

Fig. 3 Armature Controlled D.C. Motor

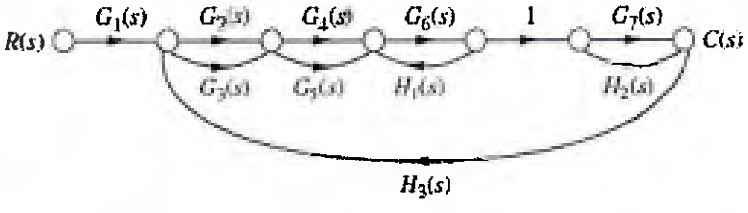

Fig. 4

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~~End Semester~~/ Re-Exam 2026 Jan-26

Program: T.Y. B.Tech. Sem-V-Ele **Duration: 3 Hours**

Course Code: PC-BTE502 **Maximum Points: 100**

Course Name: Control System-I (R23) **Semester: V**

08/01/26

Notes:
1. Question No. 1 is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Solve any **FOUR** from the following.				
a)	Differentiate between open loop and closed loop system. Give one example of each.	05	1	1,2	1
b)	Derive the expressions for position, velocity and acceleration error constant.	05	1,2	1,2,3	2
c)	Define centroid, breakaway point, angle of departure, angle of arrival and asymptotes in the context of root locus.	05	1,2	1,2	3
d)	Discuss the effect on the bode magnitude and phase plot if gain of the system increased from the original value i.e. **"K"** and changed to **"1000K".**	05	1,3	1,2,3	5
e)	Discuss time and frequency domain control system design specifications.	05	1,3	2,3	6
2. a)	Find the closed loop transfer function for the system shown in **Fig. 1** by using block diagram algebra.	10	1,2	2,3	1
b)	Consider the armature controlled d.c. motor shown in **Fig.2** . In this system , R_a - Resistance of Armature (ohm); L_a - inductance of armature winding (H); i_a - armature current (A); i_f - field current (A); e_a - applied armature voltage (V); e_b - back emf(V); T_M - torque developed by motor (Nm); θ - angular displacement of motor-shaft (rad); J - equibvlaent moment of inertia of motor and load referred to motor shaft ($kg\text{-}m^2$); fo - equivalent viscous friction coefficent of motor and load referred to motor shaft.	10	1	2,3	1

	Derive the transfer function $G(s) = \theta(s)/E_a(s)$ and also draw the complete block diagram for the same.				
3. a)	Give an example of manual Control System and suggest a solution to modify it to automatic Control system.	03	1	1,2	1
b)	Determine the value of the gain 'k' for the system, with the characteristics equation given below, to be stable. $s^3+2ks^2+(k+2)s+4 = 0$	07	1,2	2,3	2
c)	Measurements conducted on a servomechanism shows the system response to be $c(t)= 1+ 0.2e^{-60t} - 1.2\,e^{-10t}$ when subjected to a unit step input. Obtain the expression for the closed loop transfer function.	10	1,2	2,3	2
4. a)	Obtain the overall transfer function C/R from the signal flow graph shown in **Fig. 3**.	10	1,2	1,2	2
b)	Sketch the root locus of a unity feedback system with an open loop transfer function $G(s)=\frac{K}{s(s+1)(s^2+4s+13)}$	10	1,2	2,3	3
5. a)	Draw the polar plot for the transfer function $G(s)=\frac{1}{(s+30)(s+20)}$ Show the effect of modification to the above transfer function on the polar plot if one more pole is added at origin.	06 04	1,3	1,2,3	5
b)	Sketch the Bode plots for the transfer function given below. $G(s)=\frac{75(1+0.2S)}{s(s^2+16s+100)}$ Determine the gain crossover and phase crossover frequencies.	10	1,3	2,3	5
6.	Consider a unity feedback system with forward transfer function $G(s)=\frac{K}{(s+3)(s+7)}$ Using root locus technique, a. Show that the system cannot operate with a settling time of 2/3 second and a percentage overshoot of 1.5% with simple gain adjustment. b. Design a lead compensator using root locus technique so that the system meets the transient response characteristics of part **a.**	20	1,2	2,3,4	4,6

7.	Design a lag compensator so that the system of unit feedback system with $G(s)=\frac{K(s+4)}{(s+2)(s+6)(s+8)}$ operates with a **45** degree phase margin and a static error constant of **100**.	20	1,3	2,3,4	4,7

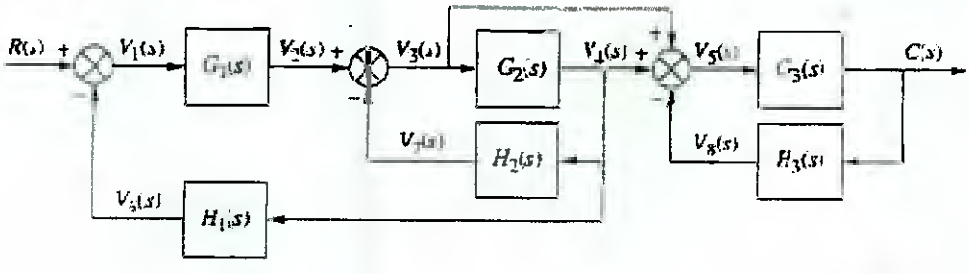

Fig. 1

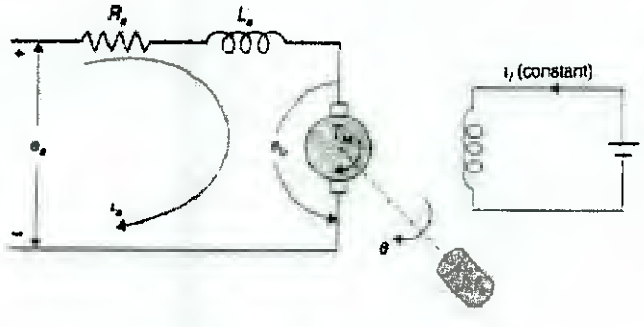

Fig. 2 Armature Controlled D.C. Motor

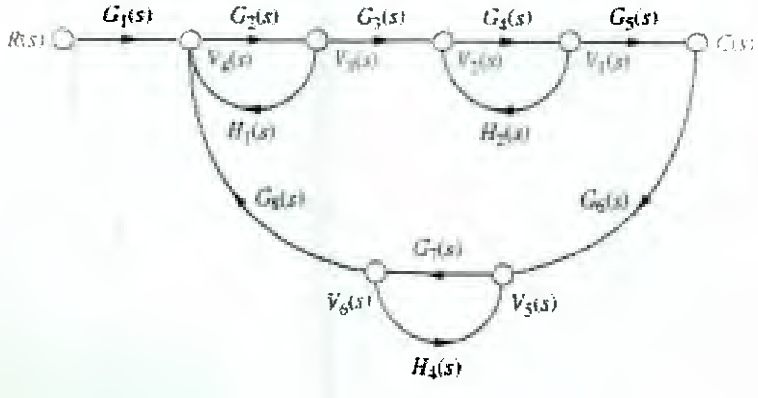

Fig. 3