BharatiyaVidyaBhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
Re-Examination
November 2016 / May 2017

Q. P. Code:
Max. Marks: 100 Duration: 3 Hour
Class: B Tech. (Electrical Engineering)
Semester: VII Program: Under Graduate
Name of the Course: **Power Electronics Applications in Power Systems** Course Code : **EE453**

Master file.

Instructions:
Answer any five questions out of seven questions. (**Q.1 to Q.7**)
Assume necessary data if required.
Draw neat sketches.
Extra questions answered (more than five) should be self cancelled.

Question No		Maximum Marks	Course Outcome Number	Module No.
Q.1	Explain the following with reference to compensation in power systems using passive elements : **a.** Surge impedance (Z_0) compensation & Line-length (θ) compensation	**10**	**1**	**1**
	b. Load Balancing	**10**	**1**	**1**
Q.2	**a.** Name and explain two types of PWM techniques. Support the answer with relevant wave forms.	**10**	**2**	**2**
	b. Explain the principle of operation of STATCOM in support of reactive power. Support your answer with relevant schematic/equivalent diagram, phasor diagram and basic equations.	**10**	**2**	**2,3**
Q.3	Explain the following with neat diagrams & respective characteristics: **a.** Thyristor Switched Capacitor & Thyristor Switched Reactor **b.** Thyristor Controlled Reactor **c.** Thyristor Switched Series Capacitor **d.** Thyristor Controlled Series Capacitor	**20**	**1**	**3**
Q.4	Explain the basic principle & control capabilities of Unified Power Flow Controller (UPFC) with **neat** Schematic diagrams / Single line diagrams / phasor diagrams/characteristics.	**20**	**2**	**4**

Q.5	a. With a neat sketch name and explain the functions of components of an HVDC converter station.	10	1	5
	b. Explain the operation of a 12-pulse converter.	10	1	6
Q.6	With reference to a mono polar HVDC link derive the following:			
	a. Equivalent circuit assuming 6-pulse converter.	10	2	7
	b. complete control characteristics including power flow reversal. Support your answer with relevant schematic/equivalent diagram, phasor diagram and basic equations.	10	2	7
Q.7	Write notes on the following:			
	a. Starting & stopping of HVDC link	10	3	7
	b. HVDC Light	10	3	7

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Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Examination
November 2016 / May 2017

Q. P. Code:
Max. Marks: 100 Duration: 3 Hour
Class: B Tech. (Electrical Engineering)
Semester: VII Program: Under Graduate
Name of the Course: **Power Electronics Applications in Power Systems** Course Code : **EE453**

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Instructions:
Answer any five questions out of seven questions. (**Q.1 to Q.7**)
Assume necessary data if required.
Draw neat sketches.
Extra questions answered (more than five) should be self cancelled.

Question No		Maximum Marks	Course Outcome Number	Module No.
Q.1	Explain the following with analytical support, relevant line diagrams & characteristics & phasor diagrams.			
	a. Effect of midpoint compensation of a symmetrical line upon P-δ curve.	**10**	**1**	**1**
	b. Control of open-circuit voltage at remote end of a simple radial line and the value of passive shunt element to be chosen.	**10**	**1**	**1**
Q.2	**a.** Suggest a pulse width modulation (PWM) technique that produces pulses of varying width. Support your answer with required waveforms.	**8**	**2**	**2**
	b. Justify that "a voltage Source Converter connected in shunt with a power system bus can support the reactive power requirement at the point of connection". Support your answer with relevant schematic/equivalent diagram, phasor diagram and with its basic equation.	**12**	**2**	**2,3**
Q.3	**a.** Explain the principle of operation of the following compensators used in power system and their characteristics showing the effect on the system Load line. (draw neat & relevant diagrams) Thyrisor Controlled Reactor (TCR) & Fixed Capacitor.	**10**	**1**	**3**
	b. Compare the effect of Static Synchronous Series Compensator (SSSC) and Thyrisor Switched Capacitor (TSC) on P-δ curve of a simple two machine system.	**10**	**2**	**4**

Q.4	**a.** Draw the neat schematic representation and name the components of Unified Power Flow Controller & then explain its basic principle of operation and the capability of simultaneously achieving conventional transmission control.	**20**	**2**	**4**
Q.5	**a.** Draw the Schematic diagram of a typical HVDC converter station with bipolar configuration using 12 pulse converters. Also name the components stating their functions.	**10**	**1**	**5**
	b. Derive the equivalent circuit representation of 6-pulse converter considering the effect of source inductance.	**10**	**2**	**6**
Q.6	With reference to a classic HVDC system connecting two ac system buses, explain the converter control characteristics under following conditions with supporting circuit diagrams and characteristics. Also define all the variable names used.			
	a. Under steady operating condition of power flow	**10**	**2**	**7**
	b. When the power flow is reversed with reference to the conditions in part **Q.6 a.**	**10**	**2**	**7**
Q.7	**a.** Suggest and explain a strategy that modifies the control characteristics of a classic HVDC transmission system to overcome the effect of low ac voltage due to faults on the rectifier or inverter side. Support your answer with neat diagrams/characteristics	**10**	**3**	**7**
	b. Name and explain with neat diagram a High voltage direct current transmission system based on solid state voltage source technology.	**10**	**3**	**7**

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Re-Examination
June-2017

Max. Marks: **100** Duration: **03 Hours**

Class: **B.TECH** Semester: **VIII** Program: **B.TECH (Electrical)**

Name of the Course: **Electrical Drives and Control** Course Code : **EE451**

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Instructions:

- Question no.1 is compulsory
- Solve any four from remaining questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- Assume suitable data if required and justify the same.

Ques. No		Max. Marks	C.O. No.	Mod. No.
Q.1 a)	What are the advantages of electric drive over mechanical drive?	05	2	1
b)	What are the different components of load torque?	05	2	2
c)	Justify the following operations in case of three phase Induction Motor. (i) Voltage is maintained constant at rated value and frequency is increased (ii) Voltage is reduced and frequency is maintained at its rated value	05	3	6
d)	What is meant by short time rating of motor?	05	3	3
Q.2 a)	What is constant torque operation and constant power operation of separately excited dc motor.	10	2	5
b)	A 3-phase, 100 KW, 6 pole, 960 rpm wound rotor induction motor drives a load whose torque varies such that a torque of 3000 Nm of 10 sec duration is followed by a torque of 500 Nm of duration long enough to attain the steady state speed. Calculate the moment of inertia of the fly wheel, if motor torque should not exceed twice the rated value. Moment of inertia of the motor is 10 kg-m^2. Motor has linear speed-torque curve in the region of interest.	10	2	2
Q.3 a)	A three phase induction motor is driving the pump type of load. Draw the combine torque speed characteristics and check the steady state stability of the operating point. Derive the condition for the steady state stability of the operating point.	04+06	2	2

b)	What is the purpose of the plugging type of braking employed for separately excited DC shunt motor. Draw the suitable circuit and the torque speed characteristics of motor during plugging.	10	2	5
Q.4 a)	A three phase induction motor is fed with balanced three phase supply and delivering 50% of the rated load. (i) What is the frequency components present in the torque developed by motor under this condition. (ii) One of the phase of induction motor is now disconnected. What are the frequency components present in the torque developed under this condition. Justify your answer.	10	1	6
b)	A 440 V, 3-Ph, 50Hz, 6 pole, 945 rpm delta connected induction motor has following parameters referred to stator: $R_S = 2\ \Omega$, $R_r' = 2\ \Omega$, Xs = 3, Xr' = 4.0 Ω. When driving the fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control determine: (i) Motor terminal voltage, current and torque at 800 rpm (ii) Motor speed, current and torque for terminal voltage of 280 V.	10	2,3	6
Q.5 a)	What is dual converter? Draw the circuit and explain the operation of converter to control the separately excited dc motor in four quadrants.	10	3	5
b)	A 3-ph, 440 V, 50 Hz, 6-pole, Y-connected induction motor has following parameters, R_S=0.5 Ω, R_r'=0.6 Ω, X_s=X_r'=1.0 Ω. Stator to rotor turns ratio is 2. If the motor is used for regenerative braking determine: (i) Maximum overhauling torque it can hold and the range of the speed in which it can safely operate. (ii) The speed at which it will hold a load with a load torque of 160 Nm.	10	2	6
Q.6 a)	Variable voltage variable frequency (VVVF) control is efficient control over the conventional control applied to three phase induction motor. Justify it. Explain the operation of three phase induction motor using V/F control in different modes: (i) Low frequency operation (ii) Medium frequency operation (iii) Frequency above F_{rated} operation	14	2	6
b)	Compare ac drive and dc drive.	06	3	5
Q.7a)	Three phase slip ring induction motor is supplying constant torque load. The speed of the motor is varied by rotor resistance control. Prove that the power drawn by the induction motor from supply is independent of variation of motor speed.	10	3	4
b)	A 220V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05Ω, is fed from a 3-phase fully controlled rectifier. Available ac source has a line voltage of 440V, 50Hz. A star-delta connected transformer is used to feed armature so that motor terminal voltage equals rated voltage when converter firing angle is zero. (i) Calculate the transformer turns ratio. (ii) Determine the value of firing angle when: motor is running at 1200 rpm and at rated torque	10	2	2

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End Sem Exam

May 2017

Q. P. Code:
Max. Marks: 100
Duration: 3 **hr**
Semester: **VIII**
Class: **Final Year**
Program: **Electrical Engineering**
Name of the Course: **Communication Network and Security**
Course Code : EE452

Master file.

Instructions:

- Question One is compulsory.
- Attempt any four of remaining six questions.
- Illustrate your answers with neat sketches wherever necessary.
- Assume suitable data if required.
- Preferably, write the answers in sequential order.

Question No.		Module Number	CO	Max. Marks
Q1.				
A)	Explain the ISO-OSI model of networks with the help of neat diagrams.	**1**	**1**	**15**
B)	Compare TCP and UDP.	**1**	**1**	**5**
Q2.				
A)	What is Frame Relay? Explain significance of DTE (Data Terminal Equipment), DCE (Data Circuit-terminating Equipment) and DLCI (Data Link Connection Identifiers) in Frame Relay operation?	**2**	**1**	**10**
B)	Explain different classes of IP addresses, give their range and usage?	**4**	**1**	**10**

Q3.				
A)	Write short notes on ATM reference model, its architecture and ATM 10 adaptation layers?	**2**	**1**	**10**
B)	Explain in detail Bluetooth architecture and its protocol stack?	**3**	**1**	**10**
Q4.				
A)	What do you understand by Cryptography? Explain different types of symmetric and asymmetric cryptographic mechanisms with examples.	**6**	**3**	**10**
B)	Explain in detail the concept of email security and PGP?	**7**	**2**	**10**
Q5.				
A)	Explain mobile IP in detail with neat diagram? Explain tunneling process in mobile IP?	**1**	**1**	**10**
B)	Explain working of digital signature? What are the advantages of digital Signature?	**6**	**3**	**10**
Q6.				
A)	Explain DSDV (Destination Sequenced Distance Vector) routing and OLSR (Optimized Link State Routing) with neat diagrams?	**7**	**2**	**10**
B)	What is reactive routing? Explain AODV (Ad-hoc On Demand Distance Vector) routing with neat diagram? What are its advantages over DSR (Dynamic Source Routing)?	**6**	**3**	**10**
Q7.				
A)	Write short notes on any two: i) Wireless sensor network. ii) MAC Protocols. iii) Public key cryptography.	**4,5**	**2**	**20**

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END SEM MAY 2017

Date :17/05/2017
Duration :3 Hr
Max. Marks : 100
Semester . VIII

Program : B.Tech Electrical Engineering
Course code : EE461
Name of the Course :Electric Traction

Instructions:

1. Question **no.1 is compulsory** and attempt any **four** questions out of remaining **six**.
2. Draw neat digrams wherever required
3. Assume suitable data if necessary and justify

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Q.No		Marks	Mod	CO
Q1 a)	Design an electric traction system comprising all the necessary requirements meeting the suitability of an efficient system of electrification. (include the type of supply, service, electrical equipments, motors, speed, signals, protection scheme etc as per their availability and merits).	15	1	CO3
b)	Justify that 25 KV ac supply is preferred over DC supply for electric traction.	5	2	CO1
Q2a)	Justify by deriving an expression for the energy saved in traction by using four motor started with series – parallel control.	10	2	CO1
b)	Two motors each of 1500 volts and armature resistance of 0.2 ohm takes 500 amperes during starting. If effective weight of train is 145 tonnes, and dead weight of 130 tonne, specific resistance of 50 N/tone, tractive effort/motor is 40000 Newton's, speed at the end of starting period 40 kmph, find 1. Duration of starting period. 2. Speed of train at transition. 3. Rheostatic loss.	10	3	CO1
Q3a)	Sketch neatly the single line diagram layout of 132 KV/ 25 KV traction power supply arrangement.	12	7	CO2
b)	Explain briefly what are the various subdivisions/subsections in the traction power supply system from main power transmission line upto 25KV catenary briefly.	8	7	CO2
Q4a)	Sketch neatly schematic layout of 25 KV OHE & write down its parameters adopted in IR.	12	5	CO2
b)	A 400 –tonne train starts up a gradient of 1 in 75 at the rate of 1.6 kmphps. The tractive resistance is 66.75 N per tonne and the allowance for rotational inertia has to be made at the value of 10 %. Determine i) The energy in kwh usefully employed in attaining a speed of 48 kmph from rest. ii) The specific energy consumption in wh per tonne-km when running at a steady speed of 56 kmph up this gradient if the overall efficiency of equipment is 70 %.	8	1	CO1

Q.No		Marks	Mod	CO
Q5a)	Draw neatly the power circuit equipment other than the traction motor and explain each device in brief.	12	3	CO2
b)	A train is required to run between two stations 1.6 km apart at the average speed of 40 kmph. The acceleration, retardation, during coasting and braking are 2kmphps, 0.16kmphps and 3.2kmphps respectively. Assuming quadrilateral approximation of speed – time curve solve for, the duration of acceleration , coasting period , braking period and the distance covered during these periods.	8	1	CO1
	OR			
	A 425 – tonne goods train is to be hauled up a 16 % gradient, 5^0 curvature at an acceleration of 12 kmphps track resistance is 43 N/tonne. Coefficient of adhesion is 0.15 and the effect of rotational mass is 12 % . Find weight of locomotive and number of axles , if axle load is not to exceed 22 tonnes.	8	1	CO1
Q6a)	Analyze the importance of signaling in railways? Analyze briefly various signaling methods adopted in Indian railways? Explain DC track circuit in brief?	12	6	CO2
b)	Describe the protection of electric locomotive equipments and circuits from over voltages and under voltages.	8	4	CO2
Q7a)	Write short notes on any **four** from the following:	20		
a)	2 X 25 KV system of power distribution		7	CO2
b)	Protection by Buchholz relay or Overload protection of main power circuit		4	CO2
c)	Magnetic levitation in electric traction		1	CO3
d)	Diesel electric traction		3	CO1
e)	Automatic warning system		6	CO2

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End Sem Examination

May - 2017

Max. Marks: **100** Duration: **03 Hours**

Class: **B.TECH** Semester: **VIII** Program: **B.TECH (Electrical)**

Name of the Course: **Electrical Drives and Control** Course Code : **EE451**

Master file.

Instructions:

- Question no.1 is compulsory
- Solve any four from remaining questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- Assume suitable data if required and justify the same.

Ques. No		Max. Marks	C.O. No.	Mod. No.
Q.1 a)	What are the advantages and disadvantages of Individual drive system?	05	2	1
b)	Draw the stable and unstable operating point of motor-load torque speed characteristics. Justify the significance of stable operating point.	05	2	2
c)	Draw the torque speed characteristics of three phase I.M. on same plane when it is fed by: (i) V, F (ii) V/2, F/2 (iii) V/2, F	05	3	6
d)	What is the significance of different motor duties? Explain any one motor duty with relevant characteristics.	05	3	3
Q.2 a)	What is static Ward-Leonard control of dc drive. Draw the block diagram and explain the variation of torque, power, armature current, field current and armature voltage as a function of speed.	10	2	5
b)	A drive has following parameters: J = 1 kg/m^2, $T = 15-0.01N$, N-m and passive load torque $T_l = 0.005\ N$, N-m; where N is speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristics is altered such that $T = -15-0.01N$, for a positive as well as negative values N. Calculate the reversal time.	10	2	2
Q.3 a)	A hoist is operating in fourth quadrant. Draw the torque speed characteristics. Suggest the suitable control when prime mover is:	10	2	2

	(i) dc drive (ii) ac drive			
b)	A separately excited DC shunt motor is fed by single phase fully controlled rectifier. Explain the operation of converter for firing angle α > 90 degree. Draw the source voltage, source current, load voltage and load current waveforms. Draw the torque speed characteristics for the same. Assume load current is continuous.	10	2	5
Q.4 a)	A three phase Induction Motor is fed with non-sinusoidal supply voltages with predominant harmonic components 5^{th} ,7^{th} ,11^{th} and 13^{th}. What are the frequency components present in the torque developed by the I.M. Justify your answer with relevant analysis.	10	1	6
b)	A 440 V, 3-Ph, 50Hz, 6 pole, 945 rpm delta connected induction motor has following parameters referred to stator: $R_S = 2\ \Omega$, $R_r' = 2\ \Omega$, Xs = 3, Xr' = 4.0 Ω. When driving the fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control determine: (i) Motor terminal voltage, current and torque at 800 rpm (ii) Motor speed, current and torque for terminal voltage of 280 V.	10	2,3	6
Q.5 a)	A separately excited DC motor need to operate in four quadrants. Draw the circuit and explain the operation of dc-dc converter for the same. What are the different modes for operation of this converter?	10	3	5
b)	A Y-connected squirrel cage induction motor has the following ratings and parameters: 400 V, 50 Hz, 4-pole, 1370 rpm, $R_S = 2\ \Omega$, $R_r' = 3\ \Omega$, $X_s = X_r' = 3.5\ \Omega$. Calculate the flowing for inverter fed induction motor drive: (i) speed for a frequency of 30 Hz and 80% of full load torque. (ii) Frequency for speed of 1000 rpm and full load torque. (iii) Torque for frequency of 40 Hz and speed of 1100 rpm.	10	2	6
Q.6 a)	Draw the block diagram for the implementation of clo... induction motor using V/F control. Explain ...			
b)	Compare the Scalar control and ... motor drive. ...osed loop control of ... all the necessary blocks.	08	2	6
	A 220 V ... vector control of three phase induction	06	3	5
c)	..., 200 A, 800 rpm separately excited dc motor has an armature resistance of 0.06 ohm. The motor armature is fed from a variable voltage source with an internal resistance of 0.04 ohm. Calculate the internal voltage of the variable voltage source when the motor is operating in regenerative braking at 80% of the rated motor torque and 600 rpm.	06	02	5
Q.7a)	Draw the block diagram and explain the hysteresis current control of three phase Induction Motor.	10	3	4
b)	Speed of dc series motor coupled to fan load is controlled by variation of armature voltage. When the armature voltage is 400 V, motor takes 20 A and the fan speed is 250 rpm. The combined resistance of armature and field is 1.0 Ω. Calculate: (i) Motor armature voltage for fan speed of 350 rpm. (ii) Motor speed for the armature voltage of 250 V.	10	2	2