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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam
May 2016

Max. Marks: **100** Duration: **04 Hours**
Class: **M.TECH** (PEPS) Semester: **II** Program: **M.TECH**
Name of the Course: **Adv. Control of Elect. Drives** Course Code : **MTPX 122**

Instructions:

- Attempt any **FIVE** question out of **SEVEN** questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- **Make suitable assumptions if required and justify the same.**

Master file.

Ques. No		Max. Marks	C.O. No.	Mod. No.
Q.1 a)	Explain the principle of vector control of Induction Motor from the analogy of separately excited dc motor.	10	05	05
b)	What is the effect of variation in switching frequency of inverter on the operation of three phase induction motor?	06	03	04
c)	What is the four quadrant operation of drive? Explain it from the torque-speed conventions	04	01	01
Q. 2a)	Draw the combine torque speed characteristics of three phase induction motor and constant power load (three phase induction motor is driving this load). Comment on the steady state stability of the operating point.	12	02	04
b)	A single phase fully controlled rectifier feeds DC motor drive connected to the constant torque load. Discuss the operation of converter to reduce the motor speed. What is the effect on the armature current under steady state.	08	03	03
Q. 3a)	Explain the effects of non-sinusoidal source voltages on the operation of three phase induction motor. Justify the presence of harmonic components in the torque.	14	02	04
b)	Draw the harmonic equivalent circuit of three phase induction motor and give the expression for the harmonic current when the supply voltages are not sinusoidal.	06	04	04
Q. 4a)	What is the condition for regenerative braking of three phase induction motor? Draw the torque speed characteristics and the phasor diagram for this operation.	08	04	02
b)	Develop the model of three phase induction motor in stationary reference frame and draw the equivalent circuit.	12	05	05

Q. 5a)	Explain the hysteresis based current controlled implementation of three phase induction motor using VSI.	10	03	02
b)	In field oriented control, the current of the motor is inherently regulated. Justify the statement with the block diagram of field oriented control of induction motor in stator flux oriented reference frame. (Mathematical equations and derivation of coupling terms are not expected).	10	05	05
Q. 6a)	Draw the block diagram and explain the hysteresis based DTC method of three phase induction motor.	12	05	06
b)	A 440 V, 50 Hz, 6 pole, star connected, 3 phase squirrel-cage induction motor has following parameters referred to stator: Rs=6 Ω, Rr'=3 Ω, Xs= Xr'=1 Ω. Normal full load slip is 0.05. The motor is fed from a voltage source inverter, which maintains a constant V/F ratio. For an operating frequency of 10 Hz. Calculate the breakdown torque as a ratio of its value at the rated frequency. What should be the V/F ratio at 10 Hz so that the breakdown torque at this frequency remains the same as at rated frequency.	08	04	04
Q. 7a)	Explain the field oriented control of three phase induction motor in rotor flux oriented reference frame. Justify the advantage in selecting rotor flux oriented reference frame for the control of three phase induction motor.	16	05	05
b)	Compare the status of AC and DC drives.	04	01	01

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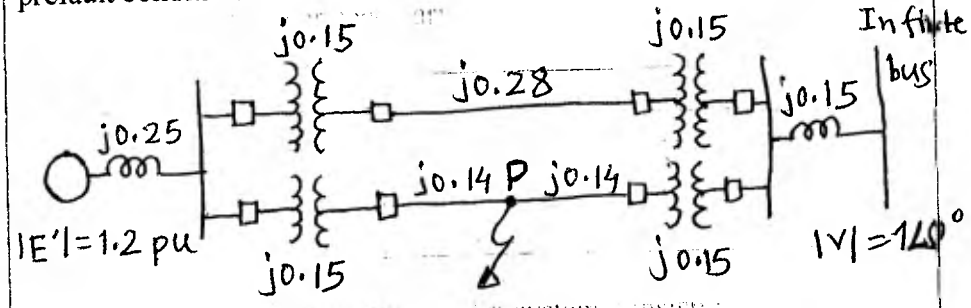
End Semester Exam
May 2016

Max. Marks: 100 Duration: 4 Hours
Class: First Year M.TECH (PEPS) Semester: II Program: M.TECH.
Name of the Course: Power System Dynamics and Control Course Code: MTPX123

Instructions:
1. Attempt **any five** questions **out of seven.**
2. Draw neat diagrams wherever necessary.

Question No		Max. Marks	C.O. No.
Q1 (a)	Derive the swing equation using power angle curve for the study of power system stability.	10	1
(b)	Find the steady state power limit of a system consisting of a generator equivalent reactance of 0.5 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.2 pu and the voltage of the infinite bus is 1.0 pu.	10	1
Q2 (a)	Find the critical clearing angle for the system shown below for a 3-phase fault at point P. The generator is delivering 1.0 pu power under prefault condition. 	10	1
(b)	Explain the different steps for determining multi-machine stability and illustrate the steps using Runge Kutta method.	10	2
Q3 (a)	Explain small signal stability and the state space representation of power system in general and hence comment on the stability of system.	10	2
(b)	Explain eigen values and modal matrix for analysis of stability of power system.	10	2

Q4 (a)	Explain the synchronous machine classical model representation.	10	2
(b)	Explain the state space model by considering the effect of excitation system on small signal stability performance of the single machine infinite bus system and represent it with the help of block diagram.	10	2
Q5 (a)	Derive mathematical formulation for voltage stability problem and obtain PV & QV curves for different p.f. and hence comment on the voltage stability of system.	10	3
(b)	Do the voltage stability analysis and assessment using modal analysis.	10	3
Q6 (a)	Describe high speed fault clearing and steam turbine fast valving methods used for transient stability enhancement.	10	4
(b)	Explain the power system stabilizers in detail used for small signal stability enhancement.	10	4
Q7	Write short notes on following:		
(a)	Rotor angle stability.	5	2
(b)	Voltage stability.	5	2
(c)	Frequency stability.	5	2
(d)	Reactive power control for voltage stability enhancement.	5	3

16 Sem
18/5/2016

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

End Sem. Examination MAY-2016

Duration: ~~3~~ **Hours**

Total Marks: **100**

Class/Sem: **M.Tech. (PEPS) / Sem II**

Sub: **Power Electronics Application in Renewable Energy Sources**

Program: **M.Tech**

Course Code: **MTPX 128**

Master file.

- Attempt any **FIVE** question out of **SEVEN** questions
- Answers to all sub questions should be grouped together
- Figures to the right indicate full marks
- **Make suitable assumption if necessary and justify the same.**

Q.1a) Describe the environmental aspects of electric energy conversion and impacts of renewable energy generation on environment. **(12)**

b) What are the different renewable energy sources. Discuss the renewable energy resources qualitatively. **(08)**

Q.2a) Draw the circuit and explain the following inverters configuration with their merits and demerits. **(12)**

(i) Grid connected inverter with low frequency transformer.
(ii) Grid connected inverter with high frequency transformer
(iii) Transformer-less grid connected inverters

b) What are the advantages of variable speed wind energy conversion system (WECS) over fixed speed wind energy conversion system? Give the suitable example of variable speed wind energy system. **(08)**

Q.3a) Compare the unipolar and bipolar PWM for the control of single phase full bridge inverter. **(12)**

b) Discuss the model of PMSG in synchronously rotating reference frame. **(08)**

Q.4a) Draw the complete block diagram and explain the operation of grid connected converter used to control the doubly fed induction generator. **(12)**

b) Draw the circuit diagram and explain the operation of FB Transformer isolated DC-DC Converter. **(08)**

Q.5a) Discuss the role of power electronics converters in the integration of renewable energy sources to dc/ac grid. **(08)**

b) Explain the earth leakage current phenomenon in PV panel. **(06)**

c) What are the advantages of soft switching techniques over hard switching techniques? Justify it with suitable current and voltage waveforms. **(06)**

Q.6 a) Draw the circuit diagram and with suitable waveforms explain the operation of three level boost converter used in solar power generation. **(10)**

b) What is shading in solar power generation? What are its effects? What are the ways to address its effects. **(06)**

c) What is direct current control and indirect current control schemes used for dc-dc converter. **(04)**

Q.7a) What is the necessity of gearbox connected between shaft of wind turbine and shaft of electrical generator? What is the concept of gearless drive in WECS. Draw the characteristics of electrical torque generated by electrical generator as a function of generator speed for a particular wind speed. **(10)**

b) Derive the leakage current model for transformer-less inverter. **(10)**

Lib Sem
16/5/2016

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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End Exam **May 2016**

Total Marks :100 Duration : 4 Hours

CLASS/SEM :ME Mechanical SEM-II SUBJECT :Design of Power Transmission System

- Attempt any five question out of seven questions
- Answers to all sub questions should be grouped together
- Figures to the right indicate full marks
- Use of Design Data Book is permitted
- Assume suitable data if necessary.

Master file.

Sr No.		Marks	CO	Module
1A	A countershaft receives 26.25 KW from a motor through a coupling and transmit it via two belt drives to two machine tools each consuming 11.25kw. The configuration is as follows. The motor is coupled at right side. The distance between the bearings is 1.5m. Both pulleys are 0.5 m apart. Pulley 1 is 0.4 m from left end bearing. Pulley 2 is 0.6m away from right end bearing. The diameters of the pulley are 0.25 and 0.6m and their corresponding weights are 400 N and 750 N. Shaft speed is 30rad /s. • Compute Total belt pull for Pulley 1 And Pulley 2 • Compute Bearing reaction in Horizontal Plane • Draw the BMD in Horizontal plane • Find bearing reaction in vertical plane • Draw the bearing reaction in Vertical Plane • Find the resultant bending moment for pulley section 1, 2 • Find the twisting moment • Show twisting moment • Find equivalent twisting moment at section 1 [of pulley 1] • Find equivalent twisting moment at section 2 [of pulley 2] • Find the shaft diameter.	[10]	CO3	M-3
1B	A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15m and the load on it is 40kN and the speed is 900 rev/min. Design the bearing. • Compute length of bearing • Compute bearing pressure • Calculate the bearing modulus • Comment on hydrodynamic conditions of bearing operation • Compute coefficient of friction • Compute heat generated • Compute heat dissipated • Compare and comment on heat dissipation and heat generation	[10]	CO3	M3

2A	A hydraulically operated clutch is to be designed for an automatically operated lathe. Determine the number of plates and the operating force required for a clutch which is to transmit the torsional moment of 35 Nm under normal operating conditions. The clutch is to be designed to slip under 300 percent of rated torsional moment to protect gears and other parts of the drive. The limits for diameters for friction-surface are 100 mm and 62.5 mm	[10]	CO3	M3
2B	A speed reducer unit is to be designed for a special machine tool for an input of 0.75 kW with a transmission ratio of 27. The speed of the hardened steel worm is 1750 rev/min. The worm wheel is to be made of the phosphor bronze. The tooth form is to be 20° involute.	[10]	CO1	M4
3A	A rope drum of an elevator having 650 mm diameter is fitted with a brake drum of 1 m diameter. The brake drum is provided with four CI brake shoes each subtending an angle of 45^{0}. The mass of the elevator is 2000 kg and moves with a speed of 2.5m/s. The brake has capacity to stop the elevator in 2.75 m. Assume Coefficient of Friction between drum and shoes 0.2 Find width of shoe if allowable pressure on shoe is limited to $0.3N/mm^2$. Find also heat generated in stopping the elevator.	[10]	CO3	M4
3B	Prepare a comparative statement for different methods of flow control in hydraulic circuit.	[10]	CO1	M2
4A	Explain briefly the main parameters affecting the selection of a hydraulic pump	[10]	CO1	M2, M6
4B	Explain the uses of Accumulator in a power transmission system with neat sketches.	[10]	CO1	M2
5A	Prepare a Comparative statement of different types of prime movers, characteristics, limitations, application and selection.	[10]	CO1	M1
5B	A Compressor is to run at 250 rpm and requires 90 KW. The drive is provided by the V-belts from an electric motor running at 750 rpm. The diameter of pulley on the compressor shaft is restricted to 1m. Whereas the centre distance between the pulleys is limited to 1.75m. The belt speed should not exceed 1600 m/min. Determine the number of V-belts required to transmit the power if each belt has a cross sectional area of $375mm^2$, Density $1000Kg/m^3$ and allowable tensile Stress of 2,5MPa.. The groove angle of pulley is 35°.The coefficient of friction between belt and pulley is 0.25. Also compute length of belt. Assume suitable data if required. Comment on Slip, Wear characteristics, Creep, Noise, Initial Cost, Maintenance cost.	[10]	CO3, CO2	M2, M6
6A	A rope drive transmits 250 kW at 300 rpm has pulley diameter 1.2m. Angle of lap 180^{0}. And groove angle 45^{0}. The ropes to be used are 50 mm in diameter. The mass of the rope is 1.3kg/m length. Each rope has maximum pull of 2200 N. the coefficient of friction between the rope and pulley is 0.3. Determine no. of ropes required. If the overhang of the pulley is 0.5 m suggest suitable size for the pulley shaft if it is made of steel with a shear stress of 40 MPa. Comment on Efficiency, slip, shaft layout, initial costs, operation cost, wear, Noise, Life.	[10]	CO2, CO3	M2, M6

6B	Design a chain drive to actuate a compressor from 15 kW electric motor running at 1000 rpm, the compressor speed being 350 rpm. The minimum centre distance is 500 mm. The compressor oprates 16 hours per day. The chain tension may be adjusted by shifting the motor on slides. Comment on Wear, Fatigue, Impact Characteristics, Efficiency, slip, shaft layout, initial costs, operation cost, wear, Noise, Life.	**[10]**	**CO2, CO3**	**M2, M6**
7A	A pair of cast iron bevel gears connect two shafts at right angle. The pitch diameter of the pinion and gear are 80 mm and 100 mm respectively. The tooth profile of the gears are of 14.5 ° composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmit the 2.75 kW at 1100 rpm find the module and number of teeth on each gear from the standpoint of strength and check the design from the stand point of wear. Take surface endurance limit as 630MPa and Modulus of elasticity for CI as 84 kN/mm^2	**[10]**	**CO2, CO3**	**M2, M6**
7B	Design a suitable compact system to conduct performance test of Pelton Wheel in a laboratory. The system will include all required elements like Pelton wheel, Centrifugal pump, Suction valve, suction pipe, Delivery valve, delivery pipe, Tank for flow measurement, etc. Justify the selection of each component. Assume suitable data. Comment on motor selection. Pump selection. Comment on Life, Noise, Vibration.	**[10]**	**CO1, CO3**	**M5, M7**

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20/6/2016

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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Munshi Nagar, Andheri (West), Mumbai – 400058.
Re - Examination
May 2016

Max. Marks: **100**
Class: **M.Tech. (Electrical)** Semester: **II** Duration: **4 hrs.**
Name of the Course: **FACTS** Program: **PEPS**
Course Code : **EE651**

Master file.

Instructions:
Note : (1) Question No. 1 is **compulsory**
(2) Attempt **any four** questions from remaining six questions
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.

Question No		Maximum Marks	Course Outcome Number	Module No.
Q1				
a)	What are the power quality problems in distribution Systems? Explain in detail.	10	1	5
b)	Describe the principle of operation of SVC with its control characteristics.	10	2	2
Q2				
a)	Write short note on series and parallel resonances for harmonic condition.	10	1	5
b)	Write short note on 1) Thermal Capability 2) Di-electric capability 3) Stability Limit	05	1	1
c)	Explain operation of TCSC in inductive region by using voltage and current waveform.	05	2	4
Q3				
a)	Describe following configuration of **SPST** i. Point on wave controlled phase angle regulator ii. Discrete step controlled phase angle regulator	10	2	4

b)	Describe the principle of operation of a TCSC, clearly indicating the different modes of operation and its analysis	10	2	2
Q4				
a)	Write short note on 1) Passive filter 2) Active filter 3) Voltage sags and swells	10	1,2	6
b)	With the help of a block diagram explain the basic UPFC control scheme. Discuss on the functional control modes of UPFC.	10	2	3
Q5				
a)	A three phase, 400 kV, 50 Hz, 800 km long line is operating with $V_s = V_R = V = 1.0\,p.u.$ and $\delta = 60^0$. A SVC is planned to be connected at the midpoint of the line to increase power transfer capability. The limits on the control range correspond to $\delta = 20^0$ and $\delta = 80^0$ (a) Find the limits of SVC susceptance if the slope (Xs) of the control characteristic is (i) 0.05 and (ii) 0.1 p.u (b) What is the maximum power flow in the line for the two cases, (i) Xs = 0.05 p.u. and (ii) Xs = 0.1 p.u. (Data: $Z_n = 400\ ohms$ and $\beta = 0.06^0/Km$).	10	2	2
b)	Give a detailed account on the working of a STATCOM. Discuss the advantages of using multi level converters in a STATCOM.	10	2	3
Q6				
a)	Compare STATCOM with SVC	05	2	2
b)	How to mitigate power quality problems using power electronic conditioners?	10	1	7
c)	What is sub synchronous resonance condition? How to mitigate sub synchronous resonance condition.	05	1	2
Q.7				
a)	Describe the principle of operation of a static phase shifting transformer	10	2	2
b)	What are basic types of FACTS controller? Explain in short.	10	1	1