Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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

End-Sem Exam

May 2018

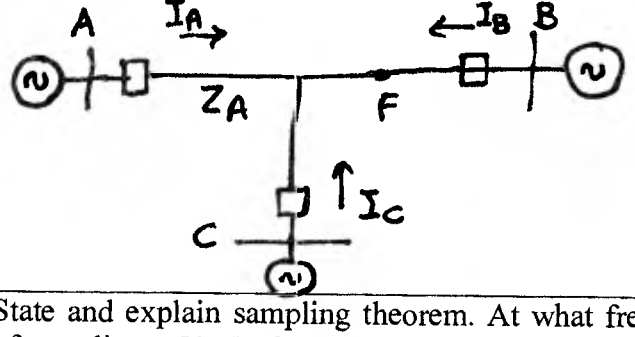
Program: M. Tech Electrical Engineering (PEPS) **Date: 16/05/2018**

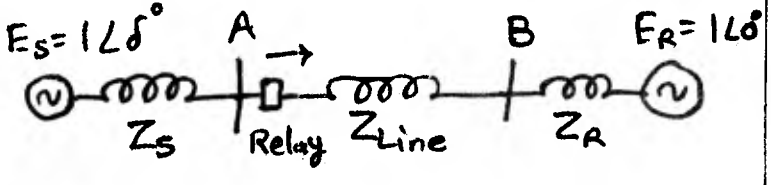
Course code : MTPX 124 **Duration : 3hr.**

Maximum Marks: 100

Name of the Course: Protection in Power System **Semester: II**

Note: Question 1 is compulsory. Attempt any 4 from remaining.

Q. No.	Description	Marks	C.O. No.	Mo. No.
Q. 1a	If Z_s is the self- impedance and Z_m is the mutual impedance of a transmission line, show that $Z_0 = Z_s + 2Z_m$ and $Z_1 = Z_2 = Z_s - Z_m$.	5	1	3
Q. 1b	Explain the Infeed effect in case of a three terminal line shown in figure with a fault at F. Explain how an adaptive relaying scheme can overcome this problem? 	10	2	6
Q. 1c	State and explain sampling theorem. At what frequency of sampling a 50 HZ frequency signal will be aliased as a DC signal.	5	2	2
Q. 2a	Elaborate intelligent load shedding and intelligent islanding in power system using WAMS Technology.	10	2	6,7
Q. 2b	What is phasor measurement unit? Explain architecture of Wide Area Measurement systems.	10	2	7
Q. 3a	Explain the conflict between dependability and security of a distance relay. How can it be overcome with WAMS Technology.	12	1	6,7
Q. 3b	Explain in brief, protection of generator against loss of excitation problem.	8	1	4

Q. 4a	Find out the ratio of fault currents for S-L-G fault to solid 3-phase fault of a generator with $Z_1 = j1.0$ pu, $Z_2 = j0.8$pu, $Z_0 = j0.3$pu. Comment on your findings.	5	1	3
Q. 4b	Assuming 'b' phase as a reference, define sequence transformation matrix. Compare with sequence transformation matrix using 'a' phase as a reference. Are they identical or not?	10	2	3
Q. 4c	Why does the 'system protection' required? List out different relays used for system protection.	5	2	1
Q. 5a	For a two machine system shown in figure, show that the apparent impedance measured by the distance relay at bus A is function of power angle δ and hence show that as the power angle δ increases, the power swing encroaches the relay characteristic in R-X plane. Show the electrical center on R-X plane. 	10	1	3
Q. 5b	What is the role of Out-of-Step blocking relay and Out-of-Step tripping relay? Explain any one blocking and tripping scheme.	10	1	3
Q. 6a	Draw and explain functional block diagram of a digital relay. What are the advantages of Numerical relaying?	10	2	2
Q. 6b	List out different abnormalities in generator operation and associated protections provided for it.	10	1	4
7	Draw and explain with neat diagram, % differential protection for a 3-phase delta/star transformer. Show the direction of current flow through CTs on primary and secondary side of transformer with dot convention. What is the necessity of adaptive differential relay for a transformer protection? Explain with the relay characteristic.	20	1,2	4

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End Semester Examination.

May 2018

Program: M. Tech Electrical Engineering **Date: 21/05/2018**

Course code: MTPX 122 **Duration: 3 hr.**

Maximum Marks: 100

Name of the Course: Advanced Control of Electrical Drives **Semester: II**

Instructions:

(i) Question no. 1 is compulsory.

(ii) Attempt any four from the remaining questions

(iii)Assume suitable data if required.

Q. No.	Description	Marks	C.O. No.	Module No.
Q. 1 a	What is an electrical drive? What are the main factors which decide the choice of electrical drive for a given application?	5	1	1
Q. 1 b	Give a brief comparison of the D.C. drive response with P, PI and PID controllers.	5	1,2	2,3
Q. 1 c	What do you understand sensor-less vector control? Enlist a few techniques proposed in the literature for the same.	5	5	5
Q. 1 d	Suggest any method to provide brushless D.C. Excitation of Synchronous motor.	5	1,4	7
Q. 2 a	With the Principles of phase control theory explain single phase half-controlled rectifier control and single phase fully controlled rectifier control of separately excited motor.	10	2,3	2

Q. 2 b	A 200 V, 1500 rpm, 50 A separately excited dc motor has an armature resistance of 0.5 Ω is fed from a three phase fully-controlled rectifier. Available A.C. source has a line voltage of 440V, 50Hz. A star-delta connected transformer is used to feed the armature so that the motor terminal voltage equals the rated voltage when converter firing angle is zero. (i) Calculate transformer turns ratio. (ii) Determine the firing angle when motor is running a 1200 rpm and at rated torque. (iii) Determine the firing angle when motor is running a -800 rpm and at twice the rated torque.	10	3,4	2
Q. 3 a	Develop a state space model and time block diagram of shunt connected dc machine and calculate steady state speed of the motor for the parameters given below : The parameters of a dc shunt machine are R_f =240Ω, L_{ff} =120H, L_{af} = 1.8H, r_a = 0.6Ω, L_{aa}=0. The load torque is 5 N.m and $V_a = V_f = 240$V.	10	3	3
Q. 3 b	Explain Closed loop control of Chopper fed D.C. drive. Also calculate duty ratio of chopper, for a chopper fed 230V, 960 rpm, 200 A separately excited D.C. motor with armature resistance 0.02Ω, for motoring operation at rated torque and 350 rpm.	10	3	3
Q. 4 a	Explain how the energy conservation is possible by the usage of variable frequency drive? What are its limitations that can be eliminated by providing torque and flux control? Explain closed loop speed control with torque and flux control of induction motor.	10	4	4
Q. 4 b	What are the benefits of using current controlled Voltage-Fed Inverter for speed control of induction motor? Explain the same with the block diagram.	10	4	4

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