**FACULTY OF ENGINEERING &TECHNOLOGY**
**M.E (Electrical Power System) Year Examination - June – 2015**
**Power System Dynamics And Stability**
**(Revised)**

[Time: Three *Hours*]　　　　　　　　　　　　　　　　　　　　　　　　[Max. Marks: 80]

"Please check whether you have got the right question paper."
*i)* Answer <u>any two</u> questions from sections A & B.
*ii)* Assume suitable data, if required.

### SECTION-A

Q.1　a)　Demonstrate that the transient stability of single machine infinite bus (SMIB) system can be explained　10
through $\int P_a d\delta = 0$

　　b)　For the power system shown in fig.1 the per unit values of different quantities are E=1.2, V=1,　10
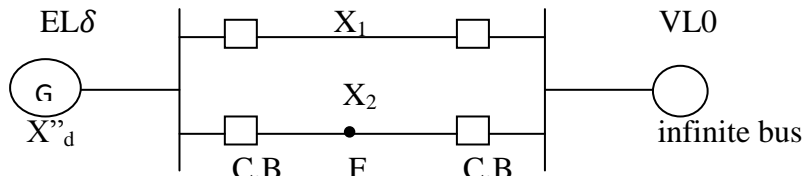$X''_d=0.2$, $X_1=X_2=0.4$.



Fig.1　　syn. M/C connected to infinite bus through an inter connector.

The system is operating in equilibrium with Pi=1.5 Pu when one of the lines is suddenly switched out. Predict whether the system will be stable or not. If the system is stable find the maximum value which $\delta$ attains.

Q.2　a)　What are the capability curves of synchronous machine? Discuss their role in voltage stability of power　10
system.

　　b)　Explain the following terms. Relating to synchronous generator　10
　　　i)　　Direct –axis transient reactance $x'_d$
　　　ii)　　Direct –axis sub-transient reactance $x''_d$
　　　iii)　　Qudrature axis transient reactance $x'_q$ & subtransient reactance $x''_q$
　　　iv)　　Time constants $T_{do}'$ & $T_d'$

Q.3　a)　explain synchronizing power co-efficient & the natural frequencies of oscillation of a synchronous　10
machine & obtain the expression for time period of oscillation in terms of machine parameters.

　　b)　A 10MVA, 4 pole, 6600 volts, 50Hz, 3 phase star- connected alternator has a syn. Reactance of 25%　10
and operates on constant voltage, constant frequency BUS-BARS. If the natural period of oscillation while operating at full-load and unity power factor is to be limited to 1.5 seconds, calculate the moment of inertia of the rotating system.

### SECTION-B

Q.4　a)　With the help of block diagram explain IEEE ST 1A excitation system-model.　10
　　b)　Explain Brushless. Excitation system for modern generators.　10

Q.5　a)　Explain the role of the excitation system in classical model studies of synchronous generators.　10
　　b)　What is load compensation scheme with reference to control arrangement for excitation system.　10

Q.6　　Write descriptive notes on <u>any two</u>　20
　　　a)　Power system stabilizers
　　　b)　Sub-synchrouous resonance & its mitigation
　　　c)　System design and operating measures to prevent voltage collapse.
　　　d)　The unregulated synchronous machine