Registration No: | | | | | | | | | | |

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B.TECH
PEEE5409

7th Semester Regular / Back Examination 2015-16
FLEXIBLE AC TRANSMISSION SYSTEM
BRANCH: EEE, ELECTRICAL
Time: 3 Hours
Max Marks: 70
Q.CODE: T584

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

a) Write two major objectives of transmission interconnection.
b) Which factors limit the transmission capacity of lines?
c) Why is it important to avail full utilization of available transmission capacity?
d) Name and explain two devices which can be used as series controllers.
e) What are the advantages of IPFC over UPFC?
f) Compare the performances of SVCs and STATCOMs.
g) How does the power flow get affected by dynamic stability conditions in any power system?
h) Explain with diagram the importance of nose point on a PV curve?
i) What do you mean by power angle characteristics? How is this different from the swing curve?
j) What are the consequences of active and reactive power imbalance in a system?

Q2 **a)** Explain any five items which may benefit the power flow control in an interconnected power system by application of FACTs technology. **(5)**

b) Justify the statement that "HVDC and FACTs are complementary technologies". Hence, cite any two major applications showing the use of HVDC and FACTs devices with a brief explanation for each. **(5)**

Q3 **a)** A transmission line connects two buses in a power system. Neglecting the resistance and capacitance parameters of the line, deduce the expression for active and reactive components of the current at both these buses by assuming suitable voltage and angle values for the buses and a suitable inductive reactance for the line. **(5)**

b) A short 230 kV transmission line with a reactance of 18Ω/ph supplies a load at 0.85 lagging power factor. For a line current of 1000 A, the voltages at both the end buses of the line are to be maintained at 230 kV. Calculate the rating of synchronous capacitor required for the purpose. **(5)**

Q4 Deduce the ratio of active power delivered over two parallel feeders of inductive reactance 'X_1=X' and 'X_2=3X' respectively. The feeders connect bus-j on one side and bus-k on the other side having same voltage magnitude at the buses. **(10)**

Two generating stations (G-1 and G-2) are inter connected by a transmission line having line impedance Z=(0+j0.05)pu. The magnitude of voltage at the two stations are equal ($|V_1|=|V_2|$=1pu). The power demands at these station buses are; S_1=(15+j5)pu and S_2=(25+j15)pu, respectively. Calculate the load angle, if the active load demand is shared equally due to the contribution of a suitable power flow in the line. Consider a limit of 20pu for the real power generation at G-1.

Q5 **a)** Explain the mid-point method of VAR compensation considering static shunt compensation technique. **(5)**

b) Explain the operating principles of variable impedance type static VAR generators with TCR and TSR type of thyristor controlled/switched reactors. **(5)**

Q6 **a)** What are the basic objectives of providing static series compensation? Also deduce the active and reactive power expressions when a line of inductive reactance 'X' is compensated with a series capacitor of reactance 'X_c'. **(5)**

b) Compare the performances of shunt compensation over that of series compensation. **(5)**

Q7 **a)** Explain the operating principles of static thyristor controlled voltage regulators with a neat diagram. **(5)**

b) Explain the operating principles of unified power flow controller (UPFC) with a neat diagram. **(5)**

Q8 Write short notes on any two: **(5 x 2)**

a) Explain the relative importance of controllable parameters for power flow control.

b) Explain the principle of operation of interline power flow controllers (IPFC) with a neat diagram.

c) Explain the operating principles of static thyristor controlled phase angle regulators.

d) Explain the principle of operation of tie-line power flow controllers (TPFC) with a neat diagram.