

**Elective - I : Flexible AC Transmission Systems**

P. Pages : 2

Time : Three Hours



**NKT/KS/17/7463**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Diagrams and chemical equations should be given whenever necessary.
  11. Illustrate your answers whenever necessary with the help of neat sketches.
  12. Use of non programmable calculator is permitted.

1. a) What limits the loading capability of transmission line? Explain each limitation in detail. **7**
- b) What are applications of FACTS devices? Compare FACTS with HVDC. **6**

**OR**

2. a) A 200 km, 66 kV transmission line having a reactance of  $0.6 \Omega/\text{km}$ . Calculate. **6**
  - i) Maximum active and reactive power over the line.
  - ii) Active and reactive power flow over the line in case of uncompensated condition. (Assume  $\delta = 30^\circ$ ).
- b) Explain AC power flow in two machine system with suitable diagram. **7**
3. a) Why there is a need of 3- level VSC? Explain its working. **7**
- b) Draw the transformer connections for 12 pulse operation and Explain its working with waveform. **6**

**OR**

4. a) Compare VSC and CSC. **6**
- b) Why harmonics are present in the output waveform of a VSC? Explain the PWM converter which can be used to eliminate the harmonics. **7**
5. a) Explain how shunt compensation improve the transient stability and prevent voltage instability of the power system. **7**

- b) Three TSC branches and one TCR branch, Each of 25 MVA are connected in Parallel. **7**
- i) Find total range of leading / lagging MVA compensated by this scheme.
- ii) If 10 MVA leading is required to supply, find status of TSC and TCR branches.

**OR**

6. a) Explain the operation of TSC - TCR type of static Var generator with reference to following. **7**
- i) Circuit Diagram.
- ii) V-I characteristics &.
- iii) VAR O/P characteristics.
- b) What is STATCOM? Draw circuit diagram and explain basic operating principle. **7**
7. a) Explain how power transmission capability is improved by series compensation. **7**
- b) Explain with neat sketch and waveform the GCSC type of series controller. **6**

**OR**

8. a) Explain SSSC and discuss its V.I characteristics. **7**
- b) What is Sub-Synchronous resonance? How Series compensation is used to damp synchronous resonance. **6**
9. a) Explain continuously controlled thyristor tap changer with resistive load. **6**
- b) Explain voltage and phase angle regulator in brief. **7**

**OR**

10. a) Explain the working of hybrid phase angle regulator. **6**
- b) Explain the working of Thyristor based voltage regulator. **7**
11. a) Explain reactive power compensation using UPFC. **7**
- b) Explain NGH-SSR damping scheme. **7**

**OR**

12. a) Explain Interline power flow controller (IPFC). **7**
- b) Explain Thyristor controlled Braking resistor. (TCBR). **7**

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