USN ☐☐☐☐☐☐☐☐☐☐ **14EPS41**

Fourth Semester M.Tech. Degree Examination, June/July 2018
FACTS Controllers

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Discuss control of power flow in AC transmission lines. **(10 Marks)**
   b. Formulate the benefits of applying FACTS controllers. **(04 Marks)**
   c. Describe the operation of 3 phase , 6 pulse VSC with neat schematic circuit diagram. **(06 Marks)**

2 a. Evaluate the equations for current and voltage at any point X on a transmission line $\{V(x) , I(x)\}$ in terms of receiving end voltage and current $\{V_R, I_R\}$ for a transmission line supplying a UPF load. **(12 Marks)**
   b. A 400 KV, 50Hz , 600 km long symmetrical line is operating at the rated voltage.
      i) What is the theoretical maximum power that can be carried by the line?
      ii) A series capacitor is connected at the midpoint of the line to double the power transmitted. Calculate the value of series reactance. The line data $\ell = 1mH/km$; $C = 11.1 \times 10^{-9}$ F/km. **(08 Marks)**

3 a. Elaborate the construction and working of SVC controller with the help of a basic block diagram. **(10 Marks)**
   b. Discuss the applications of SVC and mark the control characteristics. Also describe the operation of SVC located at midpoint of a transmission line. **(10 Marks)**

4 a. Explain the operation of TCSC with the help of a single line diagram. **(10 Marks)**
   b. With relevant current and voltage waveform, describe the working of a GCSC. **(10 Marks)**

5 a. Explain the following with respect to SPST :
      i) Point – on – wave controlled phase angle regulator.
      ii) Discrete – step controlled phase angle regulator.
      iii) Based on VSC. **(10 Marks)**
   b. Describe how the transient stability of a SMIB (Single Machine connected to an Infinite bus) System can be improved by using SPST. **(10 Marks)**

6 a. Analyse and explain three phase six pulse STATCOM, with a neat circuit diagram. **(10 Marks)**
   b. Describe principle of operation of STATCOM, with neat sketches. **(10 Marks)**

7 a. Illustrate the operation of SSSC, with neat schematic and equivalent circuit. **(10 Marks)**
   b. Describe the principle of operation of UPFC, with a neat diagram. **(10 Marks)**

8 a. Point out the applications of UPFC. **(04 Marks)**
   b. Explain how UPFC can be modeled for power flow studies. **(04 Marks)**
   c. Describe the operation of Interline power flow controller, with neat sketch. **(12 Marks)**

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