



R20 Regulation

Subject code: 3E7BD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Supplementary Examinations, April 2024

HVDC TRANSMISSION SYSTEMS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Maximum Marks: 70

Date: 23.04.2024 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10X2M=20 Marks)

- 1 State the advantages in DC transmission.
- 2 Mention any two existing HVDC lines in India.
- 3 Mention the ranges of firing angle for rectifier and inverter operations.
- 4 What is the effect of commutating reactance of the converter.
- 5 Write the advantage of constant voltage operation in the DC Link.
- 6 What is the function of DC Converter.
- 7 Define space charge field.
- 8 Define Radio interference.
- 9 What are used to filter out AC Harmonics and DC Harmonics in HVDC Transmission System.
- 10 What are the causes of Harmonics.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Derive the expression for input power, output power and power factor of 12- pulse bridge converter with delay angle α . Assume there is no overlap. [10M]
OR
- 12 A. Briefly discuss the choice of converter configuration. [5M]
B. State the apparatus required for HVDC Systems. [5M]
- 13 A. Describe Starting and stopping of DC link. [5M]
B. What is meant by firing angle delay and commutation delay. Draw the waveforms for voltage and current in 6-Pulse Graetz Circuit with $\alpha = 30^\circ$, $\mu = 15^\circ$ [5M]
OR
- 14 A. The AC line voltage of a 3-phase bridge rectifier is 400 KV when delivering a d.c power of 1000 MW. Assuming a delay angle of 30° and commutating reactance of 15Ω , find the value of d.c current and D.C voltage of the load. [5M]
B. Describe the Principle of DC Link Control. [5M]
- 15 A. Illustrate the methods for the solution of AC-DC Power Flow. [5M]
B. Transformer secondary line voltage to a 3-phase bridge rectifier is 345kV. Calculate the DC voltage output with $\mu = 15^\circ$, when $\alpha =$ (a) 0° , (b) 15° , (c) 30° . [5M]
OR

- 16 A. Explain the DC Converter and give Controller Equations. [5M]
B. Explain DC load flow with a flow chart. [5M]
- 17 Write short notes on the following:
(i) Protection against over voltage in converter station [5M]
(ii) Over current protection in a DC line. [5M]
- OR
- 18 A. Explain the operation of Smoothing reactors. [5M]
B. Write corona effects on DC lines? [5M]
- 19 A. Explain the causes of harmonic generation in HVDC and effects on the system. [5M]
B. What are characteristic and non-characteristic harmonics? [5M]
- OR
- 20 A. Illustrate the procedure for Calculation of voltage and Current harmonics. [5M]
B. Explain the design of Single tuned filter. [5M]