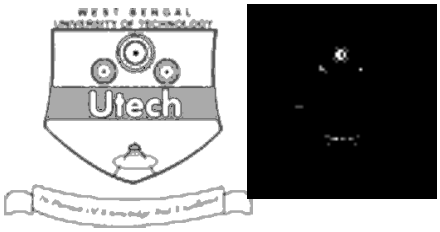
# CS/M.TECH (EE)/SEM-2/MEE-203/09
# HVDC TRANSMISSION ( SEMESTER - 2 )



1. .....
*Signature of Invigilator*

2. .....
*Signature of the Officer-in-Charge*

***Reg. No.*** | | | | | | | | | | | | | | |

***Roll No. of the Candidate*** | | | | | | | | | | | | | | |


## CS/M.TECH (EE)/SEM-2/MEE-203/09


## ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009


# HVDC TRANSMISSION ( SEMESTER - 2 )


Time : 3 Hours ] [ Full Marks : 70

***INSTRUCTIONS TO THE CANDIDATES :***

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. You have to answer the questions in the space provided marked 'Answer Sheet'. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

**No additional sheets are to be used and no loose paper will be provided**

**FOR OFFICE USE / EVALUATION ONLY**

Marks Obtained

| ***Question Number*** | | | | | | | | | | | ***Total Marks*** | ***Examiner's Signature*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Marks Obtained*** | | | | | | | | | | | | |

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**Head-Examiner/Co-Ordinator/Scrutineer**

**40006 ( 08/07 )**

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# CS/M.TECH (EE)/SEM-2/MEE-203/09
# HVDC TRANSMISSION
## SEMESTER - 2

Time : 3 Hours ] [ Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

Answer any *five* of the following. 5 × 14 =

1. a) Compare the power transfer capacities of A.C. and D.C. transmission systems when an existing A.C. line is converted into D.C. line, with following conditions :

   i) Same current and insulating level

   ii) Same percentage losses and insulation level. 7

   b) A new bipolar D.C. system is compared with a three phase A.C. system. The ratio of power transmitted by D.C. to the power transmitted by A.C. is $K_1$ , power loss in D.C. system to the power loss in A.C. system is $K_2$ and A.C. line resistance is $K_3$ times the D.C. line resistance. If cos $\phi$ is the power factor in A.C. system, then show that

   $$\frac{\text{D.C. insulation level}}{\text{A.C. insulation level}} = 0{\cdot}867\ K_1\ \cos\phi\ /\ \sqrt{K_2\ K_3}\ .$$ 7

2. In a 6 pulse full wave converter bridge circuit with ignition angle $\alpha$ and commutation angle $\mu$, find the voltage drop due to overlap and hence derive the expression of equivalent commutating resistance. 14

3. a) With neat sketches, explain the different kinds of D.C. links available. 7

b) Obtain a relation between firing angle and power factor angle in a 3-$\phi$ bridge rectifier. 7

4. a) What is meant by firing angle delay, commutation delay and extinction advance angle ? 6

b) i) A 3-$\phi$, 12 pulse rectifier is fed from a transformer with nominal voltage ratings of 220 kV/110 kV. If the primary voltage is 230 kV and the effective turns ratio is 0·48, determine the *dc* output voltage when the ignition delay angle $\alpha$ is 20° and the commutation angle $\mu$ is 18°. 3

ii) If the direct current delivered by the rectifier is 2,000 A, calculate the effective commutating reactance $X_c$ , RMS fundamental component of alternating current, power factor and the reactive power at the primary side of the transformer. 5

5. a) What is MTDC system ? What are the different types of MTDC system ? 6

b) Explain the advantages of MTDC system. 4

c) What are the functions of DC smoothing reactor ? 4

6. Explain in detail the CIA, CEA and CC control mechanism of a simple HVDC system, What are the factors have been considered to derive the practical characteristic of RC control mechanism from ideal one ? 14

7. Write short notes on any *two* of the following : 7 + 7

a) Commutation failure

b) DC circuit breaker

c) Ground return

d) Harmonics.

END