Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

V SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: GENERATION, TRANSMISSION AND DISTRIBUTION [ELE 3104]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date:26.November.2018** **Max. Marks: 50**

Instructions to students:

- Answer **ALL** the questions.
- Use of ordinary graph sheet is allowed.
- Missing data may be suitably assumed.

1A. List out the functions of the following:

(a) Draft tube

(b) Spillway

(c) Economizer

(d) Moderator ***(04)***

1B. The data of a hydroelectric power plant are: head = 50 m, catchment area = 500 km^2, annual average rainfall = 150 cm, turbine efficiency = 85 %, generator efficiency = 90 %, head lost in penstock = 7.5 %, percolation and evaporation losses = 25 %, load factor = 60 %. Determine the power developed and suggest the type of turbine to be used if 5 units with the runner speed of 240 rpm are used. ***(04)***

1C. Compute the GMR of 7 stranded conductors with the radius of each strand as 'r'. ***(02)***

2A. With a neat sketch, explain the working principle of a fast breeder reactor. ***(03)***

2B. Compute the inductance and capacitance of a 3-phase transmission line which is transposed. The distance between the conductors when measured from center to center is $D_{13} = 2D_{12} = 2D_{23} = 10$ m. Each conductor is made up of 3 equal strands in delta arrangement. The diameter of each strand is 0.5 cm. ***(04)***

2C. A balanced 3 phase load of 45 MW is supplied at 132 kV, 50 Hz and 0.85 pf lagging by means of a transmission line. The series impedance per phase of the line is (25+j60) Ω and the admittance per phase is j310μ siemens. Determine ABCD parameters using nominal T method and hence determine sending end voltage, current and line regulation. ***(03)***

3A. Explain the following:

(a) Ferranti effect

(b) Surge impedance loading ***(02)***

3B. A 3 phase transmission line has the line parameters A=0.89∠50° and B=100∠750° Ω/phase. The sending end and receiving end voltages are 132 kV. Use Graphical method to determine the following:

(a) the maximum real power that the line can deliver.
(b) the maximum real power that the line can deliver at 0.8 pf lagging.
(c) the maximum real power that the line can deliver if a compensator of 28 MVAR rating is installed at the receiving end. ***(05)***

3C. An overhead line is erected on level supports of 30 m height with a span of 100 m. The ACSR conductor used has a radius of 0.5 cm and weighs 0.7 kg/m. The allowable tension is 540 kg/cm^2. There is a coating of ice on the conductor with a radial thickness of 1 cm. The conductor experiences a wind pressure of 43 kg/m^2 of projected area. What should be the height of the cross-arm to give a minimum clearance of 10 m under bad weather conditions? Assume density of ice as 913 kg/m^3. ***(03)***

4A. A 3 phase 110 kV, 50 Hz transmission line consists of 3 conductors of diameter 10.5 mm. They are placed 3 m apart at the corners of equilateral triangle. Air temperature is 28 °C and pressure is 73 cm of Hg. Irregularity factor = 0.9 and m_v=0.7. Find the critical disruptive voltage and the power losses due to corona. Is the corona visible? ***(04)***

4B. Explain the methods to improve the string efficiency of suspension insulators. ***(02)***

4C. A 3 phase transmission line is supported by 3 disc insulators. The potentials across top unit (i.e., near to the tower) and middle unit are 8 kV and 11 kV respectively.

Calculate the following:

(a) ratio of capacitance between pin and earth to the self-capacitance of each unit
(b) line voltage
(c) string efficiency ***(04)***

5A. Prove that the most economical conductor size in a cable is r = R/2.718. ***(02)***

5B. A single core cable of conductor diameter 2 cm and lead sheath of diameter 5.3 cm is used on a 66 kV, 3-phase system. Two inter sheaths of diameter 3.1 cm and 4.2 cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltage on the inter sheaths. ***(04)***

5C. A 3 phase, 3 core metal sheathed cable, on testing for the capacitance, gave the following results:

(i) capacitance between all conductors bunched and sheath = 0.6 μF
(ii) capacitance between 2 conductors bunched with sheath and third conductor = 0.36 μF.

With the sheath insulated, find:

(a) capacitance between any two conductors.
(b) capacitance to neutral.
(c) charging current if the cable is connected to a 3 phase, 11 kV, 50 Hz system. ***(04)***