Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

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

END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: GENERATION, TRANSMISSION AND DISTRIBUTION [ELE 3104]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date:22 November 2019** **Max. Marks: 50**

Instructions to students:

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

1A. Discuss the following:

(a) Flow duration curve (b) Specific speed

(c) Draught in a thermal power plant (d) Ring main feeder ***(04)***

1B. The data for a weekly flow at a particular site for 12 weeks is as given below:

Week	1	2	3	4	5	6	7	8	9	10	11	12
Flow (m^3/s)	3,000	2,000	2,700	1,000	750	500	600	2,250	4,000	2,000	1,500	1,000

Draw flow duration and mass curves to find the size of the reservoir and the possible rate of flow available after the reservoir has been built. ***(03)***

1C. Write a technical note on feed water and steam circuit of a thermal power plant. ***(03)***

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

2B. Draw the general layout of a diesel power plant and explain the major components. ***(03)***

2C. Derive an expression for the inductance of composite conductors in a 1-phase system and hence determine the GMR of a four stranded conductor with all the strands in horizontal configuration. The radius of each strand is 'r'. ***(04)***

3A. A 3-phase, 500 kV, transposed line is composed of one ACSR Bittern conductor per phase with horizontal configuration has adjacent conductor spacing of 10 m. The diameter of each conductor is 3.25 cm. Compute i) the inductance/phase/km and capacitance/phase/km of the line and ii) the change in inductance/phase/km and capacitance/phase/km, if the existing line is replaced by Rook conductors composed of two bundles per phase in horizontal configuration with a bundle spacing of 45 cm. The conductor radius and the line spacing measured from the center of the bundle are same as before. Comment on the results obtained. ***(05)***

3B. A 3-phase transmission line has a series impedance of 4.6+j40 Ω/phase and a shunt admittance of j0.00055 siemens/phase. Calculate i) ABCD parameters using nominal pi method, ii) the efficiency and (iii) voltage regulation of the line, if the line is supplying a load of 270 MVA, 0.8 pf lag at 325 kV. Also calculate surge impedance loading in MVA. ***(05)***

4A. A 3-phase line delivers power to a load at 275 kV, pf 0.85 lagging. The line parameters are A=0.93∠ 1.5°, B=115∠77°. Using receiving end circle diagram, determine (i) the load MVA if the sending end voltage is 355 kV, (ii) the rating of the compensator at the receiving end to maintain the sending end voltage at 275 kV on no load and (iii) what would be the additional upf load supplied, if the magnitude of rating of the compensator calculated in (ii) is kept constant with sending end voltage at 275 kV. ***(04)***

4B. Determine the disruptive critical voltage on a 3-phase, 50 Hz, 220 kV overhead line consisting of conductors spaced 2.5 m apart at the corners of an equilateral triangle. Air temperature and pressure are 21 °C and 73.5 cm of Hg, respectively. Conductor diameter=1.8 cm, surface factor=0.7. Breakdown strength of air is 21.1 kV(rms)/cm. Is there any possibility of corona in fair weather condition? If yes, calculate the corona loss. ***(03)***

4C. Derive an exact expression for sag in a transmission line conductor strung between two supports at equal heights. Discuss ice loading and its effect on the sag. ***(03)***

5A. Discuss the merits and demerits of a suspension type insulator. A 3-phase overhead transmission line is being supported by three disc insulators. The potentials across top unit and middle unit are 8 kV and 11 kV respectively. Calculate (a) ratio of shunt (pin to earth) capacitance to the mutual (pin to pin) capacitance of each unit. (b) Line voltage and (c) String efficiency. ***(04)***

5B. A single core cable is graded with three dielectrics of permittivities 2, 3 & 4. The maximum permissible potential gradient for all dielectrics is same and equals to 30 kV(peak)/cm. The core diameter is 1.5 cm and sheath diameter is 5.5 cm. (i) Find the operating voltage (rms) of cable and (ii) Compare the results obtained in (i) with the cable without grading keeping the potential gradient same as before. ***(03)***

5C. The capacitance of 3-core cable belted type is measured and found to be as follows:

(a) Capacitance between three cores bunched together and to the sheath is 7.5 μF

(b) Capacitance between the conductor and the other two connected together to the sheath is 4.5 μF.

Calculate the capacitance to neutral, equivalent capacitance between two cores and the total charging kVA when the cable is connected to a 11 kV, 50 Hz, three phase supply**.** ***(03)***