Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

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

MAKEUP EXAMINATIONS, DECEMBER 2019

SUBJECT: GENERATION, TRANSMISSION AND DISTRIBUTION [ELE 3104]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date:27 December.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. Write a note on (a) Surge Tank , (b) Draft Tube and (c) Penstock ***(03)***

1B. The following data pertain to a hydroelectric plant. Available head=100m, catchment area = 500 km^2, annual average rainfall = 150 cm, turbine efficiency=85%, generator efficiency=90%. 20% of rainfall is lost due to evaporation, load factor=65%. Determine the power developed and suggest the type of turbine to be used if 7 units with the runner speed 250 rpm are used. ***(04)***

1C. With a neat sketch, explain the working of boiling water reactor power plant. ***(03)***

2A. Discuss the methods used to improve the thermal efficiency of a thermal plant. ***(03)***

2B. Draw comparison between two stroke and four stroke diesel engine. ***(02)***

2C. Define Geometric mean radius of a conductor. A 3-phase transmission line is composed of 2 bundled conductors per phase with horizontal configuration as shown in Fig. Q2(C). Find the inductance and capacitance per km length of the line, if the radius of each conductor in the bundle is 1.725 cm. Take bundle spacing (20 cm) into account while calculating GMD.

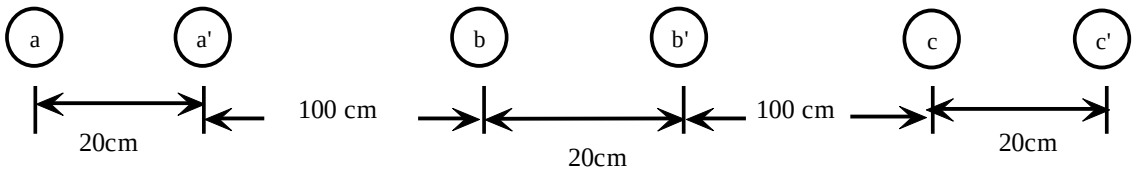

Fig. Q2(c)

(05)

3A. A 132 kV, 3-phase, 50 Hz transmission line 200 km long, has the following distributed parameters: L = 1.3 mH/km, C = $9x10^{-9}$ F/km, R = 0.2 ohms/km, G = 0. Determine the sending end voltage, current, power factor and efficiency when delivering 50 MVA at 0.8 p.f. lagging. Use rigorous (exact) method to compute ABCD constants. ***(05)***

3B. A 3 phase line has an impedance per phase of (5 + j20) ohms. The sending end and receiving end voltages are maintained at 33 kV. Determine (i) the maximum load that can be transmitted through the line, (ii) the rating of synchronous phase modifier (SPM) to be inserted at the receiving end to maintain the voltage at both the ends at 33 kV on no load, and (iii) rating of SPM to maintain 33 kV at both the ends when a load of 25 MW, 0.8 pf lag is connected. Use graphical method. ***(05)***

4A. Explain the following : (a) Skin effect, (b) Ferranti effect, (c) Loading capability of transmission line and (c) Surge impedance loading ***(04)***

4B. A transmission line has a span of 250m between the level supports. The effective diameter of the conductor is 1.4 cm and its weight is 1 kg/m. The working stress of the conductor is 1,050 kg/cm^2. The conductor is coated with ice of radial thickness 1.25 cm and subjected to a wind pressure of 40 kg/m^2. Calculate the slant sag and the vertical sag. Assume ice density as 920 kg/m^3. ***(03)***

4C. Each conductor of a 33 kV, 3-phase system is suspended by a string of three similar insulators. The capacitance of each disc is nine times the capacitance to ground. Calculate the voltage across each insulator. Also, determine the string efficiency. ***(03)***

5A. A single-core lead sheathed cable is graded by using three dielectrics of relative permittivity 5, 4 and 3 respectively. The conductor diameter is 2 cm and the overall diameter is 8 cm. If the three dielectrics are worked at the same maximum stress of 40 kV/cm, find the safe working voltage of the cable. Assuming the same conductor diameter, overall diameter and maximum dielectric stress, what will be the safe working voltage for an ungraded cable? ***(04)***

5B. A 132 kV, 3-phase line with conductors of diameter 1.956 cm is built so that corona takes place if the line voltage exceeds 210 kV (rms). If the value of the potential gradient at which the ionization occurs is 21.21 kV/cm (rms), find the spacing between the conductors. ***(03)***

5C. Explain the tests conducted on three core belted cable to measure its capacitance per phase. ***(03)***