Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
GRADE IMPROVEMENT / MAKEUP EXAMINATIONS, AUGUST 2021

GENERATION, TRANSMISSION & DISTRIBUTION [ELE 2252]

REVISED CREDIT SYSTEM

Time: 2 Hours **Date:06 August 2021** **Max. Marks: 40**

Instructions to Candidates:
- Answer **ANY FOUR FULL** questions.
- Missing data may be suitably assumed.

1A. Discuss the function of the following in a thermal power plant: (i) Pulverizer, (ii) Super-heater, (iii) Electrostatic Precipitator, (iv) condensor and (v) Economizer. ***(05)***

1B. The flow duration curve data of a site for 10 weeks is shown below. Calculate the number of Francis turbine to be used, if the runner speed is 300 rpm. Available head=80m; head lost in penstock= 5%; efficiency=90%; specific speed of the turbine=250.

% Time	10	20	40	50	60	80	90	100
Q (m^3/s)	650	600	550	500	400	350	275	200

(05)

2A. With neat diagrams, Explain the working principle of boiling water reactor and fast breeder reactor nuclear plants clearly stating the merits and demerits. ***(06)***

2B. Explain the following: (i) Fill factor, (ii) Tip Speed Ratio, (iii) Merits of 4-stroke Diesel engine and (iv) Solar irradiance. ***(04)***

3A. A three-phase transposed transmission line is as shown in the fig. Q3(A). It has 2 bundles per phase. Each subconductor of the bundle has 2 strands in it. Diameter of each strand is 10 mm. Calculate the per-phase inductance of the line per kilometer length.

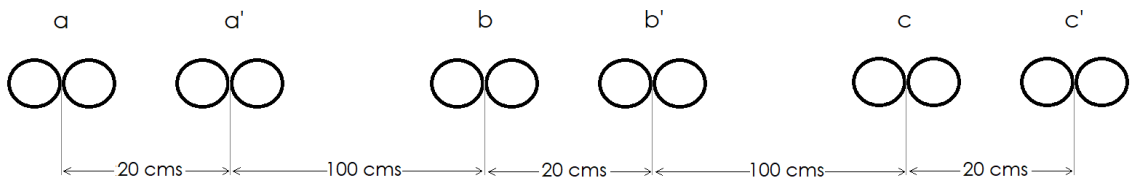

Fig. Q3(A) ***(06)***

3B. A 16 km line consists of a pair of copper conductors with 2 strands each. The diameter of each strand is 0.7 cm and conductor spacing of 1.2m. Find the impedance of the loop formed by joining the conductors at one end, for a frequency of 50 Hz. Resistivity of copper=$2*10^{-8}$ Ω-m. ***(04)***

4A. A 3-phase 300km long line has a total series impedance of 200 ∟80º Ω/ph and a total shunt admittance of 0.0013∟90º siemens/ph. Calculate i) ABCD parameters using nominal T method, ii) voltage regulation of the line, if the line is supplying a load of 60 MW, 0.8 pf lag with sending voltage of 220 kV. ***(05)***

4B. A 3-phase, overhead line has impedance/phase=30+j100 Ω. The supply voltage is 145 kV, while the load end voltage is maintained at 132 kV for all loads by an automatically controlled Synchronous Phase Modifier. If the kVAR of the modifier has the same value for zero load and for a load of 50 MW, find the rating of SPM and pf of the load. ***(05)***

5A. Two towers each of height 30 m above ground level with a span length 200 m are used for an overhead line on a ground having a gradient of 1 in 10. Each conductor has a diameter of 1 cm & weighs 2.5 kg/m which includes an ice covering of 10mm thickness. The line is subjected to a wind pressure and the slant sag measured from the lower support is 5 m. The ultimate stress is 5300 kg/cm^2 with a factor of safety of 4. Determine the wind pressure and the ground clearance at maximum sag. ***(04)***

5B. In a transmission line, each conductor is at 20 kV and supported by a string of 3-suspension insulators. The pin to earth capacitance is 1/5th of the capacitance C of each insulator unit. A guard ring, effectively only over the line end insulator unit is fitted so that the voltages on the two units nearest the line-end are equal. Calculate (a) voltage on the line-end unit, (b) the value of pin to line capacitance required and (c) string efficiency. ***(06)***

6A. Explain the factors affecting corona loss. A 3-phase, 50 Hz,132 kV line with 1.956 cm diameter conductors is built so that corona takes place if the line voltage exceeds 210 kV. If the value of potential gradient at which ionization occurs can be taken as 30 kV(peak)/cm, find the spacing between the conductors. Also find the total corona loss. ***(05)***

6B. Explain any two insulating materials used for underground cables. Find the maximum working voltage of a single core cable having two insulating materials A and B and the following data. conductor radius 0.5 cm, inside sheath radius 2.5 cm, maximum working potential gradient of A is 60 kV/cm, maximum working potential gradient of B is 50 kV/cm, permittivity's of A and B are 2.5 and 5 respectively. Also find the maximum working voltage if the cable were not graded and the insulating material A is used. ***(05)***