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Reg. No

B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Fourth Semester

18EEC208T - GENERATION, TRANSMISSION AND DISTRIBUTION

(For the candidates admitted during the academic year 2018-19 to 2021-22)

OPEN BOOK EXAMINATION

18EEC208TO

Note:

i. Specific approved THREE text books (Printed or photocopy) recommended for the course.
ii. Handwritten class notes (certified by the faculty handling the course / Head of the Department).

Time: 3 Hours **Max. Marks: 100**

Answer **FIVE** Questions
(Question No. 1 is compulsory)

			Marks	BL	CO
1	i.	Load factor of a consumer is 35% and the monthly consumption is 408 kWh. If the rate of electricity is Rs 250 per kW of maximum demand plus Rs 4.00 per kWh, find a. The monthly bill and the average cost per kWh b. The overall cost per kWh; if the consumption is increased by 10% with the same load factor.	10	3	1
	ii.	The following two tariffs are offered; (i) Rs.100 plus 15 paise per unit (ii) A flat rate of 40 paise per unit . At what consumption is the first tariff economical?	8	2	1
	iii.	A daily load curve which exhibited a 15 minutes peak of 3000 kW is drawn to scale of 1 cm = 3 hours and 1 cm =1000 kW . The total area under the load curve is measured 15 cm^2 .Then what will be the average demand (A) 1875 kW (B) 1785 kW (C) 1675kW (D) 1125 kW	1	2	1
	iv.	Two areas have equal connected loads; however, the load diversity in area A is more than in area B, then: (A) Maximum demand of two areas is small (B) The maximum demand of A is greater than maximum demand of B (C) The maximum demand of B is greater than maximum demand of A (D) The maximum demand of B is less than maximum demand of A	1	4	1
2	i.	A three-phase, 50 Hz, 60 kV overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 4 m sides and the diameter of each conductor is 1.5 cm. Determine the inductance and capacitance per phase, if the length of line is 100 km and calculate the charging current.	10	3	2
	ii.	A single phase transmission line has two conductors each of 10 mm radius. These are fixed at a center to center of 1 m in a horizontal plane. Now this is converted into a three phase transmission line by introducing a third conductor of the same radius. This conductor is fixed at an equal distance D from the two single phase conductors. The three phase line is fully transposed. The positive sequence inductance per phase of the three phase system is to be 5% more than that of the inductance per conductor of the single phase system. Find the equilateral distance 'D' of the three phase system.	8	4	2
	iii.	Calculate the resistivity of the conductor if resistance of conductor is 40 Ω, the length of the wire is 20m and its area of cross section is 4m. (A) 8 Ωm (B) 16 Ωm (C) 8 kΩm (D) 16 kΩm	1	2	2

d.

iv. For a equilaterally spaced conductors of an untransposed 3-phase line is characterized by the --------- 1 1 2

(A) Balanced receiving end voltage and no communication interference
(B) Unbalanced receiving end voltage and no communication interference
(C) Balanced receiving end voltage and communication interference
(D) Unbalanced receiving end voltage and communication interference

3 a. i. A single-phase, 11 kV line with a length of 15 km is to transmit 500 kVA. The inductive reactance of the line is 0.6 Ω /km and the resistance is 0.25 Ω /km. Calculate the efficiency and regulation for a power factor of (i) 0.75 lagging, (ii) 0.75 leading and (iii) unity. 12 3 3

b. ii. A 50Hz, 275kV line of length 400km has the following parameters: 6 3 3
Resistance R=0.035 ohm/km;
Inductance L=1 mH/km;
Capacitance C=0.01 μF/km
The line is represented by nominal π model. With the magnitudes of the sending end and receiving end voltages of the line maintained at 275 kV, Find the phase angle difference between V_S and V_R required for maximum possible active power to be delivered to the receiving end.

c. iii. Find the A and D constant of a 132kV ,400km long transmission line with its Resistance/Phase = 64Ω, XL/phase=100Ω and shunt admittance = j0.0006. 1 3 3
(A) 0.9190
(B) 0.9290
(C) 0.9590
(D) 0.9890

d. iv. For a medium line of T network type, while the receiving end phase voltage at no load is 140.86kV, the value of line constant A= 0.935 and receiving end phase voltage is 130 kV, then the percentage regulation calculated using ABCD constants will be --------- 1 2 3
(A) 2%
(B) 5%
(C) 15%
(D) 50%

4 a. i. A string of suspension insulators consists of three units. The capacitance between each pin and earth is 25% of the self-capacitance of the unit. If the maximum peak voltage per unit is not to exceed 30 kV, determine the greatest working voltage and the string efficiency. 12 2 4

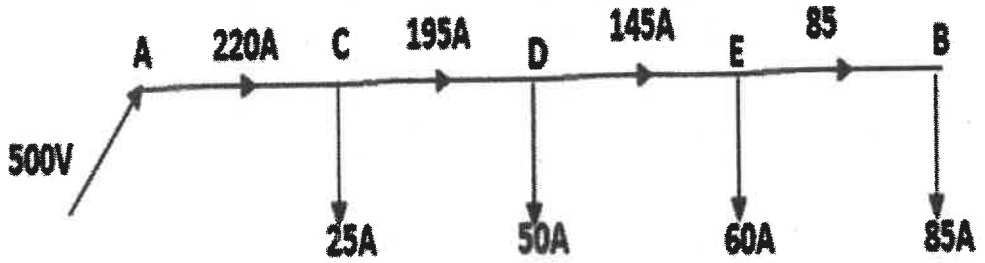
b. ii. Three insulating materials with breakdown strength of 250 kV/cm, 200 kV/cm, 150 kV/cm and permittivity's of 2.5, 3.0 and 3.5 are used in a single core cable. If the factor of safety for the materials is 5, then what is the location of materials with respect to the core of the cable, give your inference. 6 3 4

c. iii. Calculate the ice load on the transmission line at the temperature of -25°C, when the thickness of ice coating on the transmission line is 13mm and the conductor outer diameter is 27mm?(assume ice density as 920 kg/m^3) 1 4 4
(A) 1.503kg/m
(B) 15.03kg/m
(C) 150.3kg/m
(D) 0.1503kg/m

d. iv. A single core cable has conductor diameter of 2cm and sheath of inside radius 5cm, if maximum stress on the cable is 51.55 kV /cm in RMS. what will be the RMS voltage rating of the cable -------- 1 5 4
(A) 82.96kV
(B) 11.9 kV
(C) 55.45 kV
(D) 27.65 kV

5

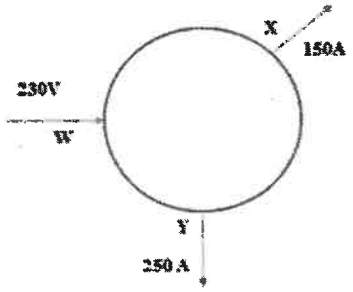
a.	i.	Find the voltage at point C,D and E for the given 2 wire DC distribution system 1000 m long as shown in figure below. Each section has same distance of 250 m. The resistance of one conductor is 0.6 W/km.	6	2	5



b.	ii.	An electric train runs between two sub-stations 6 km apart maintained at voltages 600 V and 590 V respectively and draws a constant current of 300 A while in motion. The track resistance of go and return path is 0·04 Ω/km. Calculate: (i) the point along the track where minimum potential occurs (ii) the current supplied by the two sub-stations when the train is at the point of minimum potential.	12	3	5
	iii.	Out of the given bus bar schemes, in which schemes doing any type of maintenance work is difficult.	1	1	5

(A) Single Bus
(B) Main Bus and Transfer
(C) Double Bus Double Breaker
(D) Double Bus Single Breaker

	iv.	A DC ring main WXYW is fed at point W from a 230V supply source. The resistance at R_{wx}=0.02 Ω, R_{xy}=0.025 Ω and R_{yw}=0.018 Ω. What is the current through I_{wx} I_{xy} and I_{yw}, If the current drawn at the point X and Y is 150A and 250A?	1	4	5



(A) 173.80A, -23.80 A and 226.2 A
(B) 173.80 A, -23.80 A and -226.2 A
(C) 173.80 A, 23.80 A and -376.2 A
(D) 173.80 A, 23.80 A and -226.2A

6	i.	The daily load curve for a power plant is given by the following equation:	8	5	1
a.		$L = 480 + 6t - t^2$			
		Where, t is time in hours from 0 to 24 hours and L is in MW. Calculate: a. The maximum load and its occurrance. b. Load factor of the plant.			
b.	ii.	Find the most economical size for a conductor required to transmit a maximum loading of 5000 kVA over a three-phase overhead line operated at 33 kV, the annual load factor being 50%, with 10% of allowable interest and depreciation. The cost per kilometre length of line is Rs. (24000a + 1000) where a is cross-sectional area of the conductor in cm^2 ,the cost of energy waste is 10 paise/kWh and $K = I_{rms} / I_{av}$ = 1.2 for a load factor of 50%. The resistance per kilometre of a conductor with 1 cm^2 cross-section area is 0.173 Ω.	10	2	1
c.	iii.	Calculate the economic tariff and its financial consumption unit range for the following two tariffs offered. Tariff –A: Rupees 50 plus 20 paise per unit. Tariff-B: A flat rate of 50 paise.	1	4	1

(A) Tariff-A is economical if consumption is more than 250 units
(B) Tariff-B is economical if consumption is more than 250 units
(C) Tariff-A is economical if consumption is more than 167 units
(D) Tariff-B is economical if consumption is more than 167 units

d.

iv. A 200 MW power station delivers 200 MW for 3 hours,40 MW for 5 hours and its shut down for the each day. With a maintenance for 50days in each year, what will be the total energy supplied per year? 1 3 1

(A) $252*10^3$ MWh (B) $800*10^3$ MWh

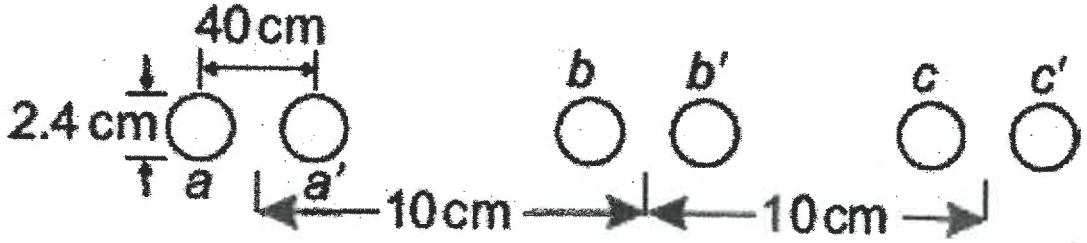
(C) $315*10^3$ MWh (D) $292*10^3$ MWh

7 i. The horizontally spaced conductors of a single phase line operating at 50Hz are having outside diameter of 1.6cm and the spacing between centre's of conductors is 6m.The permittivity of free space is 8.854*10-12 f/m. Evaluate the capacitance to ground per km of each line. 8 5 2

a.

ii. A 300 kV, three-phase bundle conductor line with two sub conductor per phase has a horizontal configuration as shown in Figure. Find the inductance per phase, if the radius of each sub-conductor is 1.2 cm. 10 2 2

b.



iii. A long over head line is composed of a smooth round conductor running parallel to the ground (Assumed to be a large conducting plane). A high voltage exists between the conductor and the ground. The maximum electric stress occurs at ------ 1 1 2

c.

(A) The upper surface of the conductor (B) The lower surface of the conductor

(C) The ground surface (D) Midway between the conductor and the ground

iv. Two arrangements of conductors are proposed for a 3 phase transmission line is: one with equilateral spacing of 4 m and the other is a flat with 4 m between the conductors. The conductor diameter in each case is 2 cm. Assuming that the line is transposed in both cases, which one of the following statements would be true? 1 3 2

d.

(A) $C_{n1} = C_{n2}$ and $L_1 > L_2$ (B) $C_{n1} > C_{n2}$ and $L_1 < L_2$

(C) $C_{n1} =< C_{n2}$ and $L_1 > L_2$ (D) $C_{n1} > C_{n2}$ and $L_1 = L_2$

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