

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019**

**Course Code: EE301**

**Course Name: POWER GENERATION, TRANSMISSION AND PROTECTION**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

Marks

- |   |                                                                                                                                                                  |     |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1 | What are the limiting factors in tapping the wind and solar potential?                                                                                           | (5) |
| 2 | Explain the principle and causes of proximity effect and Ferranti effect using appropriate figures                                                               | (5) |
| 3 | What are the critical voltages in the formation of Corona? What is the effect of Corona?                                                                         | (5) |
| 4 | With a neat cross sectional view show the constructional features of an EHT Cable.                                                                               | (5) |
| 5 | What are the essential qualities required by any insulating medium used for arc quenching? What are the usual insulating media used?                             | (5) |
| 6 | Explain the significant features of a Microprocessor based relay.                                                                                                | (5) |
| 7 | What makes the differential protection very significant in the protection schemes of electrical machines and transformers?                                       | (5) |
| 8 | Calculate the voltage drop and Power loss for a radial load of 120A, 0.8 pf lag supplied by a 6.6kV Three Phase system with a branch impedance of $2 + j2$ ohms. | (5) |

**PART B**

*Answer any two full questions, each carries 10 marks.*

- |    |                                                                                                                                                                                                                                 |     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 9  | a) With a neat sketch explain the principle of working of a High Head Hydro-electric Power Station.                                                                                                                             | (5) |
|    | b) An 80 km long transmission line has a series impedance of $(0.15 + j0.75)$ ohm per km and a shunt admittance of $j5.1 \times 10^{-6}$ ohm per km. Find the A, B, C, D parameters by Nominal Pi method.                       | (5) |
| 10 | a) Derive the inductance of a single phase transmission line with three conductors arranged vertically in Side A and two conductors in Side B. The distance between adjacent conductors in each Side is 6m and that between the | (5) |

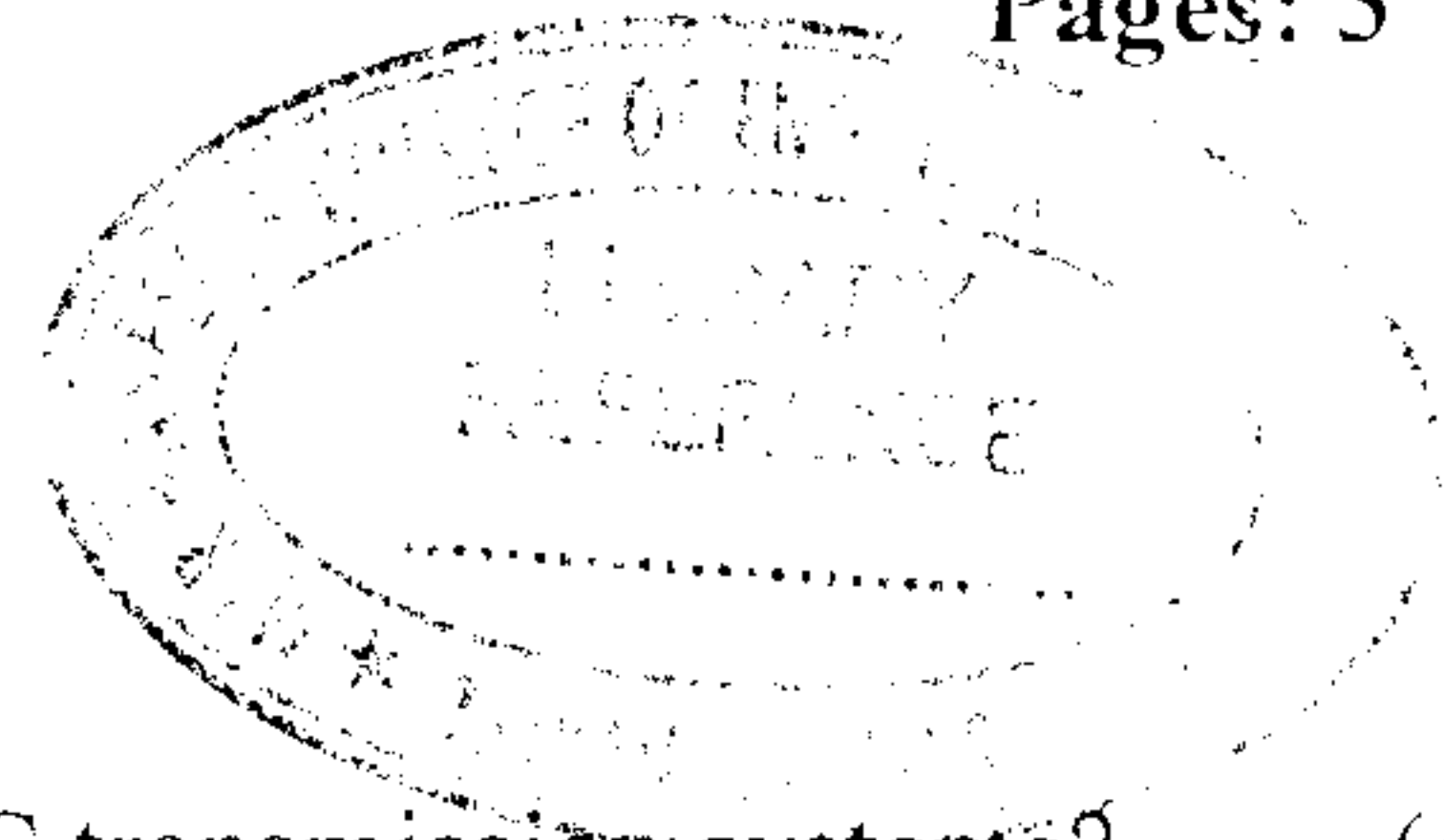
sides are 8m. Each conductor is of radius 0.3cm.

- b) A generating station has the following maximum loads: 16000kW, 12000kW, 10000kW, 7000kW and 800kW. The annual load factor is 50%. Calculate the diversity factor and annual energy consumption if the maximum demand on the station is noted as 24000kW. (5)
- 11 a) A 3-phase 500-HP 50Hz, 11kV star connected induction motor has a full load efficiency of 85% and a lagging p.f. of 0.8. It is connected to a feeder and it is desired to correct the p.f. to 0.95 lagging. Determine : (5)
- (i) The Capacitor bank rating in kVAR and
  - (ii) The capacitance of each unit if the units are connected in Star.
- b) Derive the Capacitance of a single phase overhead transmission line considering the effect of earth. (5)

### PART C

*Answer any two full questions, each carries 10 marks.*

- 12 a) Following results are obtained by making experiments on three phase, three core metal sheathed cable: (5)
- (a) Capacitance between all the three bunched conductors and sheath is 1.2 micro Farad.
  - (b) Capacitance between any one conductor and sheath and the other two being insulated is 0.8 micro Farad.
- Calculate the capacitance (C) between any two conductors when the third conductor is connected to the sheath.
- b) A transmission line conductor at a river crossing is supported from two towers at a height of 45m and 75m above the water level. The span length is 300m. Weight of the conductor is 0.85kg/m. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 2050kg. (5)
- 13 a) What is the expansion of FACTS? What are the devices used as FACTS devices? Why are they significant in the present scenario? (5)
- b) A three phase overhead transmission line is supported by three disc suspension insulators. The potentials across the first and second insulator are 9kV and 12kV respectively. Find out: (5)



- (i) The line voltage and
- (ii) The string efficiency
- 14 a) What are the advantages and disadvantages of HVDC transmission systems? (4)
- b) Derive Kelvin's law for conductors (4)
- c) What are the advantages of bundling of conductors? (2)

**PART D**

*Answer any two full questions, each carries 10 marks.*

- 15 a) In a short circuit test on a 132kV three phase system, the breaker gave the following result: power factor of the fault =0.6, recovery voltage 0.97 of full line value; the breaking current is symmetrical and the restriking transient had a natural frequency of 16kHz. Determine the rate of rise of restriking voltage. Assume that the fault is grounded. (6)
- b) Derive the equations for voltage drop and current loss in a two wire ring main distributor supplied by (i) DC and (ii) AC Voltages. (4)
- 16 a) With a neat sketch explain the principle of operation of an Air Blast Circuit Breaker (5)
- b) What are the primary causes of over voltages? How are the equipments protected from over voltages? (5)
- 17 a) Explain the principle of operation of a static over current relay. (5)
- b) What are the three main protection aspects included in the protection of alternators? Why are they significant? (5)

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