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PRESIDENCYUNIVERSITY BENGALURU

 SCHOOL OF ENGINEERING

SUMMER TERM

SUMMER TERM END TERM EXAMINATION – AUGUST 2024

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| **Semester: V** | **Date: 05.08.2024**  |
| **Course Code: EEE2008/EEE2020** | **Time: 1.00pm to 04.00pm** |
| **Course Name: Electrical Distribution Systems** | **Max Marks: 100** |
| **Program: B. Tech EEE** | **Weightage: 50%** |

**Instructions:**

1. *Readallquestionscarefullyandansweraccordingly.*
2. *Questionpaperconsistsof3parts.*
3. *Scientificandnon-programmablecalculatorare permitted.*
4. *DonotwriteanyinformationonthequestionpaperotherthanRoll Number.*

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| **PART A** |
|  **ANSWER ANY 4 QUESTIONS 4Q X 5M=20M** |
| 1 | Define loss factor? How is it related to load factor? List its significance. | (CO 1) | [Knowledge] |
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| 2 | Define the term Load and mention the different types of load modeling.  | (CO 1) | [Knowledge] |
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| 3 | Define the term substation. List out the various types of substations. | (CO 2) | [Knowledge] |
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| 4 | List out the comparison between AIS and GIS. | (CO 2) | [Knowledge] |
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| 5 | A considerable amount of effort is necessary to maintain an electric power supply within the requirements of various types of consumers. List out the requirements of a good distribution system. | (CO 3) | [Knowledge] |
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| 6 | Define Distribution Automation. List out the various parts of the distribution system. | (CO 4) | [Knowledge] |
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| **PART B** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** |
| 7 | The amount of energy or electrical power that is consumed by a certain utility can change throughout the course of a single day, as well as over the course of a week, month, or year. For instance, during the summer season, fans, air conditioning units, and other types of coolers are utilized; however, during the cold season, these items are not utilized. Industrial operations that take place during the day will result in merely the consumption of lighting loads throughout the night (10 p.m. to 6 a.m.). Therefore, it is vital for distribution planning to have an understanding of the nature and variance of the loads. In distribution networks, briefly discuss the significance of the load curve, the load duration curve, and the relationship between the two. | (CO 1) | [Comprehension] |
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| 8 | Estimating the load variation of typical industrial motors in response to voltage and frequency changes is necessary for a load model study. In order to calculate the new rating, it is used the nominal rating of the motors, which was 415 V, 50 Hz, 3 Ph, and 100 kW at p.f. = 0.85. It is  then adjusted the voltage to 440 V and the frequency to 50.5 Hz. Estimate the new rating at (i) V = 440V, f = 50.5 Hz(ii) V = 380 V, f = 49.0 Hz. Use the power law asP = 1.0 + 0.15 ΔV + 2(ΔV)^2, DP = 1.6Q = 0.657 + 2.35 ΔV + 6.6 (ΔV)^2, DQ = –0.65   | (CO 1) | [Comprehension] |
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| 9 | The key parts of a substation are the bus-bars. A substation can make use of a variety of bus-bar configurations. There are a number of considerations that go into deciding on an arrangement, including system voltage, sub-station location, reliability level, cost, and so on. It has been suggested that a 33/11 KV substation be built in Yelahanka. First, if a problem develops on one part of the bus, it can be switched off independently from the rest of the bus. Second, there is no need for a full power outage if any part of the busbar needs to be repaired or maintained; it is sufficient to simply turn off power to that part. Identify the best bus bar arrangement and develop the layout of the 33/11 KV lines substation, which will have two sections, two incoming lines, and four outgoing lines. | (CO 2) | [Comprehension] |
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| 10 | A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels. A substation may include transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages. Discuss the various types of substations based on the constructional & service required and obtains comparison between the outdoor and indoor Sub-Stations.   | (CO 2) | [Comprehension] |
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| 11 | The electrical energy produced at the generating station is conveyed to the consumers through a network of transmission and distribution systems. It is often difficult to draw a line between the transmission and distribution systems of a large power system.It is impossible to distinguish the two merely by their voltage because what was considered as a high voltage a few years ago is now considered as a low voltage.In general, distribution system is that part of power system which distributes power to the consumers for utilization. Discuss the various parts of the distribution system with necessary diagrams. | (CO 3) | [Comprehension] |
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| 12 | The basic requirements of the protective system are relative to the cost and flexibility to the extent the system is safe guarded against the possible damage and burning off. It is also required to give least orno disturbance to the normal operation and remove the fault and restore the system to normalcy at theminimum possible time. Summarize the importance of protection system and also discuss the various protective devices used in the distribution system. | (CO 4) | [Comprehension] |
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| 13 | It is an integrated system concept for the digital automation of distribution sub-station, feeder and user functions. It includes control, monitoring and protection of the distribution system, load management and remote metering of consumer loads. The distribution automation contains: Computer hardware, Computer software, Remote terminal units (RTUs), Communication systems, Consumer metering devices, relays. Summarize the role of SCADA in distribution automation system. | (CO 4) | [Comprehension] |
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| **PART C** |
|  **ANSWER ANY 2 QUESTIONS 2Q X 15M=30M** |
| 14 | 1. The load curves of two different categories of loads and system peak load are as follows. Determine the diversity factor and coincidence factor for the system.

 Peak load for industrial load 2000 kW Peak load for Residential load =2000 kW System peak load Dg = 3000 kW1. A feeder supplies 2 MW to an area. The total losses at peak load are 100 kW and units supplied to that area during a year are 5.61 million. Calculate the loss factor & Average Loss factor.
 | (CO 1) | [Application] |
| 15 | The various blocks of Presidency University are connected with DC distributor line from the main distribution point to meet the load requirements. The distributor wire consists of 2-wire AB which is having 300 meters long. It is fed at point A. If the maximum permissible voltage drop is not to exceed 10 V, What could be the cross-sectional area of the distributor conductor? Take ρ = 1·78 × 10^−8 Ωm. The various loads of the blocks and their positions are given below

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| At point | Distance from A in meters | Concentrated load in amperes |
| D | 40 | 25 |
| F | 100 | 30 |
| P | 150 | 110 |
| B | 350 | 60 |

 | (CO 3) | [Application] |
|  |
| 16 | A single phase A. C. distributor line AB 300 metres long is fed from end A and is loaded as under : 100 A at 0·707 p.f. lagging 200 m from point A. 200 A at 0·8 p.f. lagging 300 m from point A.The load resistance and reactance of the distributor is 0·2 Ω and 0·1 Ω per kilometre. Identify the unknown parameters that could be found from the given data and compute the same | (CO 3) | [Application] |