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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023**

Semester : Semester V - 2020

Course Code : EEE2020

Course Name : Sem V - EEE2020 - Electrical Distribution Systems

Program : B.Tech. Electrical and Electronics Engineering

Date : 11-JAN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.*
 - (ii) Question paper consists of 3 parts.*
 - (iii) Scientific and non-programmable calculator are permitted.*
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PART A

ANSWER ALL THE TEN QUESTIONS

10 X 2 = 20M

1. A better approach to the classification of loads is to divide them into individual load components. The components of a particular load are individually defined and modeled. All the components put together form the composite load and can be defined as a 'LOAD WINDOW' as per definition.
 - a) IEEE (CO1) [Knowledge]
 - b) IEC
 - c) ICAR
 - d) DRDO
2. The electrical transmission system in India is 3-phase ac system of 50 Hz and as such the distribution systems receive power from a 3-phase system only. Depending on power requirement and ratings, the loads can be
 - a) single phase or 3-phase (CO1) [Knowledge]
 - b) single phase or 4-phase
 - c) four phase or 3-phase
 - d) None of the above

3. A load or power requirement (also kVA) of a consumer varies widely. In general the consumers can be grouped into a few categories as their needs and demands are the same. A broad classification of loads are;
- a) Domestic and residential loads. (CO1) [Knowledge]
 - b) Only lighting loads
 - c) Commercial loads & Industrial loads.
 - d) All of the above
4. The process of connecting non-current-carrying metal parts (i.e. metallic enclosure) of the electrical equipment to earth (i.e. soil) in such a way that in case of insulation failure, the enclosure effectively remains at earth potential is called.....
- a) Service mains. (CO2) [Knowledge]
 - b) Distributor
 - c) Equipment grounding
 - d) Feeders
5. A is a high voltage substation in which the major conducting structures are contained within a sealed environment with a dielectric gas known as SF₆, or sulfur hexafluoride gas as the insulating medium.
- a) Gas Insulated Substation. (CO2) [Knowledge]
 - b) Air insulated Substation
 - c) Oil insulated substation
 - d) All of the above.
6. There are several ways of classifying sub-stations. The two most important ways of classifying them are according to Service requirement and Constructional features. The sub-stations which change the voltage level of electric supply are called
- a) Frequency changer sub-stations. (CO2) [Knowledge]
 - b) transformer sub-stations
 - c) Switching sub-stations
 - d) Power factor correction sub-stations
7. A distributor is designed from the point of view of the voltage drop in it. It is because a distributor supplies power to the consumers and there is a statutory limit of voltage variations at the consumer's terminals. The distributor is connected to the supply mains at both sides and loads are tapped off at different points along the length of the distributor is called
- a) Distributor fed at one end (CO3) [Knowledge]
 - b) Distributor fed at both ends
 - c) Distributor fed at the center
 - d) Ring distributor
8. The part of power system which distributes electric power for local use is known as.....
In general, the distribution system is the electrical system between the sub-station fed by the transmission system and the consumer's meters. It generally consists of feeders, distributors and the service mains.
- a) distribution system (CO3) [Knowledge]
 - b) substation
 - c) receiving station
 - d) All of the above

9. Distribution system planning is the process electric utilities use to determine appropriate investments in the infrastructure that delivers power to individual homes and businesses. As the energy industry changes, distribution system planning must modernize, as well To ensure the followings;
- a) Reliable service for customers (CO4) [Knowledge]
 - b) Utilities regularly assess their distribution systems
 - c) Determine whether any modifications, upgrades, or additions are necessary
 - d) All of the above
10. Any distribution system planned is used to transport a “certain amount of power to maximum capability from the source point at one location to another location with certain consequences, the Planning determines;
- a) the routing of lines & locations of network (CO4) [Knowledge]
 - b) substations
 - c) distribution transformers
 - d) All of the above

PART B

ANSWER ALL THE FOUR QUESTIONS

4 X 10 = 40M

11. As the residential or commercial areas expand as a result of an increase in population and the addition of new areas, it will be necessary to account for the new loads that are being added. Additionally, it will be necessary to take into account the diversity among similar loads and the non-coincidence between the peaks of different types of loads that are being added. This will maximize the effectiveness of the additional capacity that is going to be provided. The aim is served by taking into account the variance in the peaks of the various types of loads. Actual connected loads consist of: (i) lighting and fans, (ii) a refrigerator, (iii) central air conditioning and heating, (iv) domestic appliances like mixers, wet grinders, and the like, (v) televisions, music systems, and other electronic devices, and (vi) other appliances like electric washing machines, dryers, and the like. It is vital to estimate the various load patterns connected to the system in order to determine how the load window can support the identification of the load pattern because the load varies in different ways and has distinct characteristics. Provide a summary of the main methods of load modelling along with the associated mathematical equations
- (CO1) [Comprehension]
12. 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.
- (CO2) [Comprehension]
13. Transmission and distribution systems link power plants with end users so that people can use the electricity generated at such plants. A large power system's transmission and distribution systems are not always well defined. Given that what was once deemed a high voltage is now regarded as a low voltage, voltage alone cannot be used to differentiate between the two. The term "distribution system" refers to the section of the power grid that physically delivers electricity to homes and businesses. Identify the various components of the distribution system and explain them.
- (CO3) [Comprehension]

14. This system concept digitally automates distribution sub-stations, feeders, and end-user operations as a unified one. Load management, as well as remote metering of consumer loads and distribution system control and monitoring, are all part of this. Distribution automation is made up of technology such as computers, software, RTUs (remote terminal units), communication systems, consumer metering devices, and relays. Explain briefly how SCADA contributes to distribution automation.
(CO4) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS

2 X 20 = 40M

15. 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) $V = 440\text{V}$, $f = 50.5\text{ Hz}$
(ii) $V = 380\text{ V}$, $f = 49.0\text{ Hz}$. Use the power law as
 $P = 1.0 + 0.15 \Delta V + 2(\Delta V)^2$, $DP = 1.6$
 $Q = 0.657 + 2.35 \Delta V + 6.6 (\Delta V)^2$, $DQ = -0.65$

(CO1) [Application]

16. Presidency University's various buildings are linked via a DC distributor line from the central distribution point to accommodate peak demand. The distributor wire is 300 metres long and made up of two wires of type AB. Feeding occurs at location A. If the distributor conductor's voltage drop must be kept below 10 V, what is the largest possible cross-sectional area it can have? Take $\rho = 1.78 \times 10^{-8} \Omega\text{m}$. Here are the various block loads and where they should be placed:

At point	Distance from A in meters	Concentrated load in amperes
D	40	30
F	100	40
P	150	100
B	300	50

(CO3) [Application]
