Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

Course Code: EE405
Course Name: Electrical System Design

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		Explain the significance of IS codes in electrical system design? How can we design a proper earthing system using IS codes for various electrical systems?	(5)
2		Discuss the functions of MCB. What are the criteria for the selection of MCB?	(5)
3		Draw the single line diagram of a 500kVA, 11kV/415V indoor substation and justify the component ratings.	(5)
4		Write short note on the substation earthing system.	(5)
5		Explain the factors to be considered for an efficient lighting system design.	(5)
6		Explain the laws of illumination with a neat diagram.	(5)
7		Define continuous power, standby power and prime power of a standby generator.	(5)
8		What are different types of PV system designs used in electrical systems for renewable energy integration?	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	Discuss the aims of Indian Electricity Act 2003.	(4)
	b)	Explain the pre-commissioning tests conducted for domestic installations.	(6)
10	a)	What are functions of RCCB? How does RCCB protect the electrical installation under fault conditions?	(5)
	b)	Explain the significance of NEC 2011 in Indian power sector.	(5)
11		The plan layout of a three-bedroom domestic building is shown in figure. Compute the following (a) Connected load for the building (b) Maximum demand in kW	(10)

(c) Type of supply required

(d) Number of light and power sub circuits

(e) The details of the distribution board

Select the requirements of light, fan and plug sockets in each room as per the standards. Any missing data may be assumed

PART C

Answer any two full questions, each carries 10 marks.

12 a) A substation has to be installed in a residential complex having a load of 50kVA, taking supply from a nearby 11kV line. Which type of substation must be chosen for this application? List out the materials required for the installation of this substation. (6)

b) Why it is important to perform pre-commissioning test before energising a substation? Discuss any three pre-commissioning tests for transformers. (4)

13 A 500kVA, 11kV/433V delta-star connected transformer is installed in an (10)

industry. This transformer is connected to 11kV supply through an over-head line of length 2 km. The conductor used is RABBIT with an equilateral spacing of 900 mm. The percentage reactance of the transformer is 3.5% and the full load copper loss of the transformer is 2%. The three-phase short circuit power at the utility substation is 300MVA. The resistance of the line conductor is 0.454Ω/km. Calculate the following parameters at the primary and secondary of the transformer. a) Initial symmetrical short circuit current and b) peak short circuit current. Any missing data may be assumed

14 The following motors have to be installed in a plastic manufacturing industry (10)

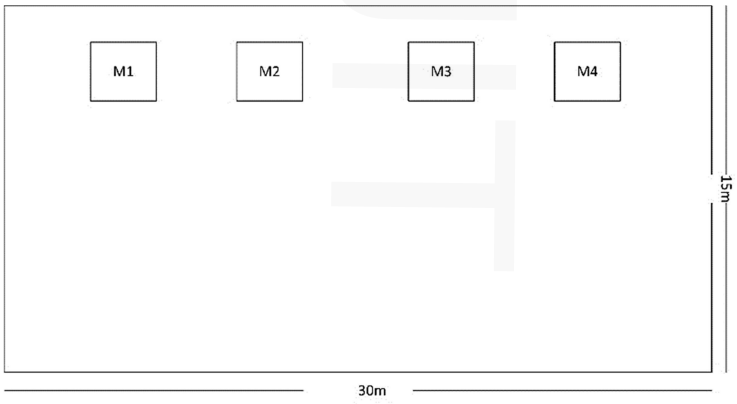
i. 5.5hp, three phase motor (M1)

ii. 3hp, three phase motor (M2)

iii. 1.5hp, single phase motor (M3)

iv. ¼ hp, single phase motor (M4)

The positions of the machines are given below. Select the suitable components for the motor wiring system and draw the wiring circuit diagram with required components. Any missing data may be assumed



PART D

Answer any two full questions, each carries 10 marks.

15 a) Explain Coefficient of utilisation and LLF in illumination systems. Explain in detail the factors affecting LLF? (5)

b) State the importance of LLF and CU in lighting design. An illumination of 300 lux is to be produced on the floor of a room 12m x 9m. 10W LED lamps of 1000lumens are used for the installation. Considering CU and LLF as 0.7, calculate the number of lamps required for the installation. (5)

16 a) How can we optimize the energy consumption in lighting and power circuits? Suggest effective energy conservation techniques for domestic application. (5)

b) Explain the requirements to be satisfied while selecting and installing a standby generator for medium voltage applications? (5)

17 A residential building has the following electrical loads (i) Three CFL (18 W each) used for 4 hours/day (ii) Two Ceiling fans (60 W each) used for 8 hours/day (iii) One refrigerator (125 W) used for 24 hours with 50% duty cycle (iv) One washing machine (125 W) used for 1 hours/day. Calculate total watt-hour/day for all appliances taken together. Determine the watt-hour/day to be generated by the solar panels. Design a suitable solar plant, which is to be installed at a location having a minimum solar irradiation of 4.83kWh/m^2/day. Assume 30% energy losses/panel and de-rating factor=0.69. Any missing data may be assumed. (10)

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