Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (R, S) Exam (FT / PT) April 2025 (2019 Scheme)

Course Code: EET402

Course Name: ELECTRICAL SYSTEM DESIGN AND ESTIMATION

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

PART A

Answer all questions, each carries 3 marks.

		Marks
1	List out the standards values of voltages to be used in electrical systems as per NEC 2011. Also give the tolerance levels for these voltages.	(3)
2	Explain the role of Electricity Supply Code 2014 with regards to electrical system installation.	(3)
3	Define the terms (i) luminous intensity (ii) illuminance (iii) luminous flux.	(3)
4	In a street lighting scheme, two lamps each having a uniform intensity of 600Cd are mounted on the poles at a height of 9m. The poles are installed 20m apart. Calculate the illumination at a distance midway from the lamps.	(3)
5	How are equipment protected from earth leakage fault in the domestic electrical installations?	(3)
6	A domestic installation has five fans, fifteen LED lamps, one refrigerator, one 750W water pumping motor, one water heater, seven 5A sockets and three 15A power sockets. Calculate the number of sub-circuits required for this system.	(3)
7	Select a suitable cable for a three phase 5 HP, 415 V, 50 Hz, induction motor.	(3)
8	Draw single line diagram of a 11 kV/415 V outdoor substation with rating of components.	(3)
9	What are rising mains in an electrical installation?	(3)
10	Explain the standby rating and prime power rating of a stand by generator.	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	What are the significances of IS codes in the electrical system installation? Explain the relevance of IS 732 and IS 3043.	(8)
	b)	Explain the scope of Electricity Act 2003.	(6)

OR

12 a) Why National Electrical Code, 2011 is important in design of electrical systems in India? (8)

b) Draw the standard graphical symbols as given in National Electrical Code, 2011 for (i) Auto transformer (ii) 5A socket outlet (iii) Three phase squirrel cage induction motor (iv) Over-head line (v) Fault (vi) Alternating current with neutral. (6)

Module II

13 a) Explain the general considerations for a good interior lighting scheme. (8)

b) A parking space of 200mx100m has to be illuminated to a level of 20 lux with Sodium vapour lamps. The mounting height of the available poles is 10m. Assume two luminaries per pole. The details of lamps available are given below. Design a suitable lighting system as per the requirements. (6)

Lamp type	CU	LLF	Wattage	Lumen output
HPS	0.7	0.75	100	9500
			150	16000
			250	26000
LPS	0.65	0.95	90	12500
			135	21500
			180	33000

OR

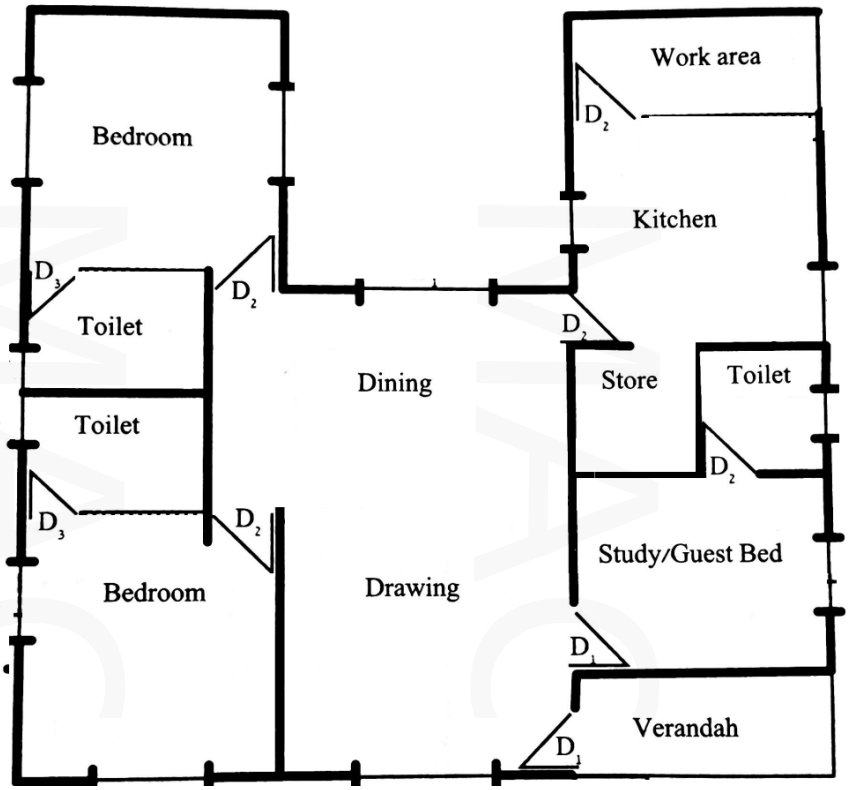
14 a) A class room 30x15m is to be illuminated by 40W fluorescent lamps of 4200 lumens. The average illumination required within the class-room is 200 lux. Calculate the number of lamps required to be installed in the room. Assume the coefficient of utilisation as 0.6 and depreciation factor as 1.5. (4)

b) Discuss the merits and demerits of any three luminaries that are commonly used for road lighting. (6)

c) Explain the lamp spacing for different classes of roads according to National Electrical Code, 2011 with the help of necessary diagrams. (4)

Module III

15 a) Design a suitable electrical installation for a single floor residential building whose floor-plan is given below. Assume the loads appropriately and compute the following (i) Connected load of the building (ii) Type of supply required (iii) Number of power and light circuits and (iv) details of distribution board. (6)



b) Explain the working of circuit breaker. (8)

OR

16 a) Explain the design considerations for the domestic electrical installations. (6)

b) Explain the importance of pre-commissioning tests in a domestic wiring system. Discuss the commonly performed pre-commissioning tests for domestic installations. (8)

Module IV

17 In an outdoor substation installed for an industrial installation, the supply is taken from a 11kV supply through an over-head line of length 2 km. The conductor with nominal area of cross section 53mm^2 with an equilateral spacing of 900 mm is used to power the substation. A 500kVA, 11kV/415V delta-star connected transformer with a percentage reactance of the transformer is 3.5% and the full load copper loss of the transformer is 2% is installed in this substation. The three-phase short circuit power at the utility substation is 400MVA. The resistance of the line conductor is 0.4Ω/km. Calculate the peak short circuit current at the primary side of the transformer. Select the suitable dimension for copper earth electrode at the primary side of transformer. Assume the maximum permissible current density of copper is 118A/mm^2. (14)

OR

18 a) Design and prepare the list of materials required for a substation to be installed for an industry having a connected load of 85kVA. (8)

b) How industrial buildings are classified according to National Electrical Code, 2011? (6)

Module V

19 a) Suggest methods to improve the energy efficiency of an electrical installation. (6)

b) What are the special requirements for the electrical installation in a high-rise building. (8)

OR

20 Design a roof top off-grid solar PV system with MPPT for a domestic system at a site with a minimum average solar irradiation of 4.75 kWh/m^2/day. The solar system should supply the following essential loads for two consecutive cloudy days. (14)

Sl. no	Load	Number of appliances	Usage in hours/day
1	28W BLDC Fan	4	12
2	14W LED	4	8
3	9W LED	4	10
4	160W Refrigerator	1	24 hours with 50% duty cycle

Select suitable PV panels, battery, charge controller and inverter for the above requirement.

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