

A

0400EET402052302



Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (R, S) / S8 (PT) (R) Examination May 2024 (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 | Explain why the The Electricity Act of 2003 is significant. | (3) |
| 2 | What distinguishes the NEC 2011 from the Indian Electricity Rules of 1956? | (3) |
| 3 | Explain the advantages and efficacy of LED lamps in comparison to conventional lighting. | (3) |
| 4 | Define the terms (a) Luminous flux (b) Illuminance (c) Luminous intensity | (3) |
| 5 | What is a load survey and what is its significance in the design of electrical systems? | (3) |
| 6 | What are the general aspects of design of domestic dwellings as per NEC and IS 732? | (3) |
| 7 | List the pre-commissioning tests for an indoor 11kV substation and describe any one of them in detail. | (3) |
| 8 | Illustrate and describe the measurement and calculation of earth resistivity with formula. | (3) |
| 9 | What are the rising main systems utilized in high-rise buildings? Draw a neat diagram. | (3) |
| 10 | What are the various methods available for improving the power factor? | (3) |

PART B

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

Module I

- | | | |
|----|--------------------------------------------------------------------------------------------|-----|
| 11 | a) Explain the significance of the IS codes IS 732 and IS 3043. | (7) |
| | b) What is standardisation, and how does NEC 2011 aid in the design of electrical systems? | (7) |

OR

- | | | |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 12 | a) Draw the NEC standard graphic symbols for: i) Circuit breaker, ii) Star-Delta starter, iii) Isolator, iv) Socket Outlet, 5A v) Socket Outlet, 15A | (5) |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|

- b) List five safety measures incorporated into the design of electrical systems (9)

Module II

- 13 a) Explain the construction and working principle of Metal Halide and High-Pressure Sodium Vapour lamps. Compare their performance. (6)
- b) An assembly shop of 20 m long, 10 m wide and 4 m upto the truss is to be illuminated at a level of 220lux. Take Coefficient of Utilisation = 0.75 and maintenance factor = 0.8. Calculate the number of lamps required for the illumination system. Lumen output of lamp = 3500 lumens. Assume any other required data appropriately. (8)

OR

- 14 a) Explain the working of LED lamp with suitable diagram. (6)
- b) A main road 3 km long and width of 9 m is to be illuminated by 80W lamps. The lamps are mounted on poles of 10m height and the minimum illumination is 0.8 lux. Design a lighting scheme using underground cable feeder. Assume any missing data properly. (8)

Module III

- 15 a) Describe (with relevant diagrams) the various pre-commissioning tests that must be performed on a domestic electrical installation: (a) measuring insulation resistance (b) Continuity test (c) Polarity test (d) Measurement of earth resistance. (7)
- b) Find the total connected load, type of supply, and number of sub circuits for a home with the following rooms: one bedroom with an attached bathroom, living room, dining room, and kitchen. Determine the number of light, fan, socket, and exhaust fan points required by NEC for the structure. Assume any other required data appropriately. (7)

OR

- 16 a) Using diagrams describe the operation of the following line protection devices: (7)
(a) ELCB/RCCB (b) RCBO (c) MCB (d) Isolator
- b) A guest-house has six air-conditioned rooms with private bathrooms, a kitchen, and a dining room. Prepare a room-by-room list of electrical installation materials. Draw a schematic of the distribution board with MCB ratings and sub-circuits indicated. The design must conform to NEC specifications. Assume any other required data appropriately. (7)

Module IV

- 17 a) What are the criteria followed for design and selection of components for the main switch board (MSB) with motor loads? (6)
- b) A steel mill has the following connected load: (8)
- 1) Large motor 200kW – 1 no.
 - 2) Paint shop motor 5kW – 3 nos.
 - 3) Lathe shop motors 7.5kW – 3 nos.
 - 4) Water pump 15kW- 1 no.
 - 5) Lighting load 6kW

Select the transformer and diesel generator rating. Draw the schematic diagram showing details of switchgear and cable sizes. Assume a diversity factor of 1.3. Assume any other required data appropriately.

OR

- 18 a) List and prepare a typical bill of quantity for an indoor substation availing 11kV supply, featuring a 250kVA transformer (6)
- b) For a 11kV HT consumer, design the earthing system and calculate the number of plate earth pits (size of plate: 1200mm x1200mm x12mm). Soil resistivity = 100 Ω -m. current density for copper = 118A/mm². 11kV side fault current = 8.704kA. Assume any other required data appropriately. (8)

Module V

- 19 a) Explain the principle of operation of an AMF panel in an electrical system. What is its necessity in an industry? (7)
- b) List the design steps required for typical residential solar PV systems. (7)

OR

- 20 a) Define: a) Continuous power rating of diesel generating set b) Prime power rating of diesel generating set c) Standby power rating of diesel generating set (5)
- b) With neat diagram write briefly on the different components of a solar PV system along with classification of systems. (9)
