

**EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2009**

EE 04 801—ELECTRICAL SYSTEM DESIGN AND ESTIMATION

(2004 admissions)

Time : Three Hours

Maximum : 100 Marks

- I. (a) Three light points in a room uniformly spaced, each controlled by one way switch are to be wired. All switches are to be placed on one switchboard.

Draw the following :—

- (i) Schematic diagram.
 - (ii) Wiring diagram in multi line representation.
 - (iii) Wiring diagram in single line representation.
 - (iv) Wiring diagram in joint box system.
- (b) What are the differences between neutral and Earth wires ?
- (c) What are the main classification of building lighting arrangements ?
- (d) An office $30\text{ m} \times 15\text{ m}$ is illuminated by 40 W fluorescent lamps of lumen output 2700 lumens. The average illumination required at the work place is 200 lux. Calculate the number of lamps required to be fitted in the office. Assume coefficient of utilisation to be 0.6 and depreciation factor 1.25.
- (e) A large factory having a total uninstalled load of 400 kW, is given 11 kV 3 supply. It contains a number of 415, 3-phase induction motors of large rating. Describe the layout of the necessary apparatus between the high voltage terminer and 50 kw, 415, 3d slipping induction motor, with suitable diagrams.
- (f) Explain how the ratings of cables and fuses are decided for motor installation.
- (g) State the reason for establishing sub-stations. Briefly explain various types of sub-stations.
- (h) A pole mounted 100 kVA, 11 kV / 415 V sub-station has to be installed for giving supply to an institute. Make a list of the material required.

(8 × 5 = 40 marks)

- II. (a) Briefly explain the various types of internal wiring.

Or

- (b) A single phase LT line is to be extended from a distribution sub-station to a residential colony of 50 houses having 10 kW load. Estimate the material requirement for an overhead LT line using an ACSR 13 mm^2 copper equivalent with a span length of 67 m.

Turn over

- III. (a) An office $30\text{ m} \times 15\text{ m}$ is illuminated by twin 40 W fluorescent luminaries of lument output 5600 lumens. The lamps being mounted at a height of 3 m from the work place, the average illumination required is 240 lux . Calculate the number of lamps required to be filled in the office, assuming the coefficient of utilisation to be 0.6 and maintenance factor to be 0.8 . Also estimate the quantity of material required and its cost for the installation of the above. Assume the height of the building as 5 m .

Or

- (b) Explain in detail the various design and safety aspects which has to be considered for electrical installation in residential buildings.
- IV. (a) A room $18\text{ m} \times 6\text{ m} \times 5\text{ m}$ is to be wired in PVC wiring from a $\phi 230\text{ V}$ supply. There are two rows of lamps along the length of the room. The number of lamps may be suitably assumed. Each lamp is controlled by an independent switch. The wiring along the wall is 4 m above the ground and the switches are 1.3 m above the ground. Draw the installation plan and determine the quantity of materials required and cost for the material and labour.

Or

- (b) Briefly explain the design consideration of electrical installation in commercial buildings.
- V. (a) What are the general requirement of earth and explain in detail about the various electrodes used for earthing.

Or

- (b) An 11 kV overhead line is to be run through a distance of 3 km from an existing 11 kV overhead line. An indoor sub-station $11\text{ kV} / 415\text{ V}$ is to be erected at the terminal point of this overhead line. The $11\text{ kV} / 415\text{ V}$ transformer is to feed the following loads.
- (i) Production shop having a load of 400 kW of 3ϕ and 1ϕ motors.
 - (ii) Foundry shop having a load of 150 kW .
 - (iii) Administration block having light and fan loads of 100 kW .

Estimate the quantity of material required for the installation of the overhead line and the indoor sub-station. (Assume the P.F to be 0.8 and load factor to be 0.6).

($4 \times 15 = 60$ marks)