KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.E.
Year : IV

Course : EPEG 416
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 05 MAR 2019

SECTION "A"

[20Q × 0.5=10 marks]

Encircle the most appropriate answer for the following questions.

1. Distribution board system of electrical installation in buildings is preferred because....
   a. it is cheaper
   b. it requires less wires and conduits
   c. installation is easy
   d. voltage level is maintained

2. The wire size preferred for wiring light circuit for a residential building is ..... SWG.
   a. 1/18 b. 3/22 c. 7/22 d. 7/18

3. The maximum number of points recommended to be connected to a power circuit is .....
   a. 1 b. 2 c 3 d. 5

4. VIR (Vulcanised Indian Rubber) cable is not preferred over PVC cable because of its drawback of having.....
   a. rubber b. enamel c. sulphur d. zinc

5. Power sockets are to be installed at a height..... m from the floor level.
   a. 0.25 b. 1.05 c. 2.5 d. 2.75

6. The wiring in which PVC insulated wires are placed in the grooves of wood is called ..... wiring
   a. conduit b. batten c. cleat d. casing and capping

7. The earth resistance for a building should not be more than..... ohm.
   a. 1 b. 5 c. 8 d. 10

8. The load pattern of an industrial complex is as given in table-1. The size of the transformer required for the complex is ....kVA.
   a. 55 b. 58 c. 60 d. 42

Table-1 : Hourly load pattern of an industrial complex in kVA

Time	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Block1	1	1	1.5	1.5	1.5	2.5	30	42	40	10	1	1
Block2	0.3	0.3	0.8	2.5	2.8	0.3	5	13	18	20	0.3	0.3

9. The size of aluminium cable required to supply a single phase load of 10kW at power factor of 0.6 lagging which is 15m away from the voltage source so that the voltage drop in the cable does not exceeds 2% of the supply voltage of 220V, is ..... square mm.
   a. 9.29 b. 15.49 c. 34.09 d. 75.75

10. Illumination of one lumen per square meter is called .....
    a. candela b. candle power c. lux d. foot candle

11. As per the NS standard, the recommended level of illumination for a study location in a building is .....lux.
a. 100 b. 200 c. 300 d. 500

12. It is required to flood light the front of a building 20m×50m of a concrete building in an industrial town by projectors fixed on the ground 50m away from the building. The required illumination is 100 lux, the maintenance factor is 0.6, the waste light factor is 1.2 and the beam factor is 0.4. If the output from one lamp is 25000 lumens, the total number of the lamps required for the flood light is .....
a. 22 b. 18 c. 15 d. 20

13. Two light sources each having a uniform intensity of 400cd are mounted 10m high and 24m apart. The illumination underneath the lamps at a distance the midway between the lamps is ..... lux.
a. 1.049 b. 2.09 c. 4 d. 40

14. For a semi-automatic star-delta starter for a three phase induction motor the minimum number of contactor to operate the motor is.....
a. 1 b. 2 c. 3 d. 4

15. For a star-delta starting of an inductor motor the phase voltage is reduced to about.... of its normal value, thus reducing the starting current and torque.
a. 30% b. 40% c. 50% d. 60%

16. The motor recommended for textile machinery is..... motor.
a. dc series b. dc shunt c. synchronous d. induction

17. A lift has a rated speed of 1.2 m/s, and a car load of 13 passengers. If the overall system efficiency is 75%, and the counterweight ratio of 50% is used, the size of the motor for the lift is .....kW
a. 5.738 b. 15.3 c. 7.65 d. 0.102

18. The peak sun of a site is 4, the energy required by the load is 2000Wh, the derating factor is 0.9 and columbic efficiency is 0.95. The system voltage is assumed to be 24V. The size of solar module required for the load is .....A.
a. 584.7 b. 24.3 c. 87.9 d. 78.9

19. The cell voltage of a fully charged lead acid battery is approximately .....V.
a. 1.685 b. 1.1 c. 2.1 d. 12.6

20. For a room of size 3m × 3m, the illumination required is 200lux, the luminous flux produced by a lamp to be used is 1200 lumens, the coefficient of utilization is 0.8 and the maintenance factor is 0.7. The number of lamps required to illuminate the room as required is .....
a. 2 b. 4 c. 1 d. 3

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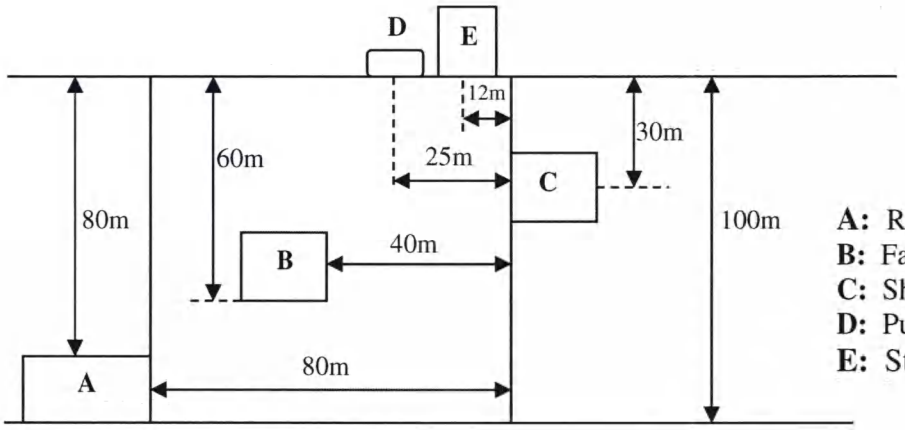
SECTION "B"

Attempt *ANY FIVE* questions. Assume necessary data if required.

1. The plan for the ground floor of a residential building is shown in the attached sheets. For the ground floor, [8]
   i. Locate the position of the electrical fixtures and sockets as per your assumptions.
   ii. Draw the electrical layout of light circuits and power circuits required on separate sheets provided.
   iii. Calculate the total load and determine the rating of MCB /MCCB required for the floor.
   iv. Draw the distribution board plan for the floor.

2. a. Figure-1 shows the layout plans for different buildings for a small cottage industry. Determine the electrical load centre for the industry and also determine the size of feeder lines for 2% voltage drop for 230V supply. [4]



A: Residence with 20kW load;
B: Factory with 30kW load;
C: Shop with 5kW load;
D: Pump of 5kW;
E: Store with 5kW

Figure-1

   b. What is earthing? Mention the necessity of earthing for a building. Describe the different types of earthing methods adopted for buildings. [4]

3. a. Draw the schematic diagram, wiring diagram and single line diagram to control two lamps and one fan by their individual switches. [3]

   b. A road 500m long is required to be illuminated by providing 25W LED lamps. The width of the road is 4m and the minimum level of illumination required is 0.6 lux. Assume the luminous intensity of 25W fluorescent lamp to be 222.8 candelas with coefficient of utilization of 0.5, and the height of the lamp to be 9m. Determine the number of street lamp poles required for the road section. [3]

   c. With the construction diagram explain the working of a high pressure mercury vapour lamp. [2]

4. a. An industrial plant consists of three conveyor belts as shown in figure-2. Belt 1 can move in both the directions. Belt 2 and belt 3 are to carry materials to belt 1, thus the two belts move in one direction only. Belt 2 and belt 3 can run only after 30 seconds of belt 1 running. If belt 1 is stationary, belt 2 and belt 3 should stop automatically. If required belts 2 and 3 can be also be stopped separately. Each belt is driven by their separate motors. Draw the control circuit and power circuit diagram for such installation. Explain the control working mechanism of the system. [6]

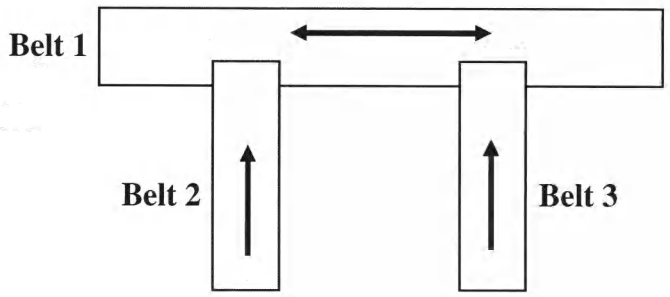


Figure-2

b. Mention the requirements for motors used in lifts, cranes, paper mill and household appliances. [2]

5. a. The average daily load curve of a multi storey residential building is presented in figure-3. The building is located at a site with an average solar radiation of 5.5kwh/m^2/day. Design a solar photovoltaic system to meet the daily load of the building. Specify the size of the photovoltaic array, battery, charge controller and inverter, assuming all ac loads.

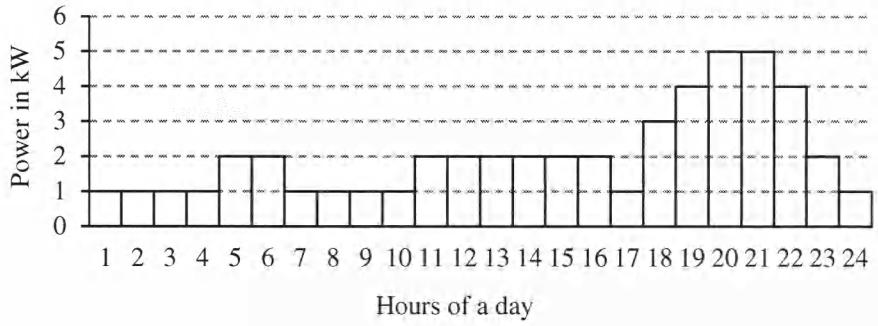


Figure-3: Average daily load curve of a multi storey residential building

Also specify the size of a backup diesel generator required to fulfil the need of the same load in absence of the supply from the solar photovoltaic system. [6]

b. Explain the type of batteries used as a backup for commercial electrical loads. [2]

6. a. Explain the different types of lighting arrangements for a building. [3]

b. Describe the need of energy conservation in an industry. List the energy conservation measures to be carried out in an industry. [3]

c. What is a public addressing system? Describe the installation requirements for a public addressing system for an airport. [2]