Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Level : B.E.
Year : III

Course : EPEG 301
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : AUG 12 2018

SECTION "A"
[20 Q. × 0.5 =10 marks]

Choose the most appropriate answer.

1. Taking the density of water to be 1000 kg/m^3 , how much power would be developed by a hydroelectric generator unit, assuming 100% efficiency, with 1.0m head and 1.0 m^3/s discharge:
   a. 2.90 kW
   b. 4.45 kW
   c. 9.80 kW
   d. 19.60 kW

2. Water hammer occurs in:
   a. Surge tank
   b. Penstock
   c. Turbine casing
   d. Draft tube

3. Steam is superheated in order to:
   a. improve Rankine cycle efficiency
   b. reduce initial condensation losses
   c. avoid too high temperature in the last stage of the turbine
   d. all of the above

4. Which of the following distribution system is preferred for good efficiency and high economy?
   a. Single phase, 2 wire system
   b. 2-phase, 3 wire system
   c. 3-phase, 3 wire system
   d. 3-phase, 4 wire system

5. For the same voltage drop, increasing the voltage of a distributor n times
   a. reduces the x-section of the conductor by n-times
   b. increase the x-section of the conductor by n-times
   c. reduces the x-section of the conductor by n^2 times
   d. increase the x-section of the conductor by n^2 times

6. With the same maximum voltage to earth, which of the following ac system with 0.8 pf will need more copper in comparison to dc 2-wire system?
   a. Single-phase, 2-wire (midpoint earthed)
   b. Single-phase, 3-wire (neutral half of outer)
   c. Three-phase, 3-wire
   d. Three-phase, 4-wire (neutral = outer)

7. For high-voltage transmission lines, conductors are suspended from tower so as to:
   a. increase clearance from ground
   b. reduce clearance from ground
   c. take care of increase in length
   d. reduce wind and snow effects

8. Guy wire is employed for:
   a. providing protection against surge
   b. providing emergency earth route
   c. supporting the pole
   d. all of the above

9. Post type insulators are generally used in lines operating:
   a. above 100 kV
   b. below 33 kV
   c. at any voltage
   d. at 66 kV

10. Critical voltage limit of a transmission line is increased by:
   a. increasing the radius of the conductor
   b. increasing the spacing between the conductors
   c. reducing the spacing between conductors
   d. reducing the radius of the conductors

11. The ABCD constants of a 220 kV line are:
   $A = D = 0.94 \angle 10°$, $B = 130 \angle 73°$, $C = 0.001 \angle 90°$. If the sending-end voltage of the line for a given load delivered at a nominal voltage is 240 kV, the % voltage regulation of the line is:
   a. 5
   b. 9
   c. 16
   d. 21

12. The main criterion for selection of the size of a distributor for a radial distribution system is:
   a. voltage drop
   b. corona loss
   c. temperature rise
   d. capital cost

13. A uniformly loaded dc distributor is fed at both ends with equal voltage. In comparison to a similar distributor fed at one end only, the maximum voltage drop will be:
   a. one-fourth
   b. one-half
   c. one-third
   d. one-sixth

14. Bulk power transmission over long HVDC lines are preferred an account of:
   a. low cost of HVDC terminals
   b. no harmonics problem
   c. minimum line power losses
   d. simple protection

15. Which of the following results in a symmetrical fault:
   a. single phase to earth
   b. phase to phase
   c. all the three phase to earth
   d. two phase to earth

16. For the same conductor length, same amount of power, same losses and same maximum voltage to earth, which system require minimum conductor cross sectional area?
    a. Single phase ac
    b. 3 phase ac
    c. 2 wire ac
    d. 3 wire dc

17. By increasing the transmission voltage double of its original value, the same power can be dispatched keeping the line loss:
    a. equal to its original value
    b. half of original value
    c. double the original value
    d. one-four the of original value

18. The short-circuit current of an alternator, in case of line to line fault, depends on its:
    a. short-circuit resistance
    b. transient reactance
    c. synchronous reactance
    d. none of the above

19. The sag of the conductor of a transmission line is 2.5 m when the span is 250 m. Now if the height of supporting tower is increased by 25%, the sag will:
    a. reduced by 25%
    b. increased by 25%
    c. reduced by 12.5%
    d. remain unchanged

20. In a circuit breaker, ionization is facilitated by:
    a. increase in field strength
    b. increase of mean free length
    c. high temperature of surrounding medium
    d. all of the above

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SECTION "B"
[5 Q × 8 = 40 marks]

Attempt *ALL* questions. Assume any suitable data if necessary.

1. a. Give a general layout of a hydro-electric power plant. Explain the function of different components in pump storage reservoir plant. [1+3]
   b. What are the needs for the combined working of the power plant? Explain the working of any one typical combination of power plants. [2+2]

2. a. The cost of a two-core feeder cable, including installation is NRs. (90 a+20) per meter and the interest and depreciation charges are 10 percentage. The cable is 2 km in length and cost of energy is NRs. 0.06 per unit. The maximum current in the feeder is 280 A and the demand is such that the copper loss is equivalent to what would be produced by the full current flowing for 8 months. If the resistance of a conductor of 1 cm^2 and 1 km length is 0.178 Ω, calculate the most economical cross-sectional area. [4]
   b. Using the nominal pi-method, find the sending-end voltage and voltage regulation of 250 km, 3-phase, 50 Hz transmission line delivering 45 MVA at 0.85 power factor lagging to a balanced load at 230 kV. The line has a series impedance of 27.5 + j97.4 Ω and shunt admittance of 7.68 $*10^{-4}$ mho. Neglect leakage. [4]

3. a. A distributor AB is fed from both ends. At feeding point A the voltage is maintained at 235 V and at B 236 V. The total length of feeder is 200 m and load loads are tapped as under. 20 A at 50 m from A; 40 A at 75 m from A; 25 A at 100 m from A and 30 amperes at 150 m from A. The resistance per 1000 m of one conductor is 0.4 Ω. Calculate the current in various sections of the fedder, the minimum voltage and the point at which it occurs in the system. [4]
   b. A transmission line conductor at a river crossing is supported from two towers at the heights of 50 m and 80 m above water level. The span is 300 m. If the tension in the conductor is 2000 kg, find the clearance between the conductor and water level at a point midway between the towers. Weight of conductor per metre is 0.844 kg. Assume that the conductor takes the shape of parabolic curve. [4]

4. a. Explain why the voltage drop is of primary concern in the design of the distributors. What are the effects of voltage level on line performance? [2+2]
   b. Explain the working principle of differential protection system for a three phase power transformer with necessary diagram. [4]

5. Write short note on the following topics: [2+2+2+2]
   a. Earthing System
   b. Ferranti effect
   c. Comparison between AC and DC transmission line
   d. Fault clearing process of a CBs.