

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Marks scored:

Level : B.E.
Year : III

Course : CIEG 312
Semester: II

Exam Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date

AUG 15 2018

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose the most appropriate answer.

1. The power output from an hydroelectric power plant depends on:
 - a. Type of dam, type of catchment area and discharge
 - b. Type of dam, head and system efficiency
 - c. Discharge, head and system efficiency
 - d. Type of turbine, type of dam and type of catchment area

2. If rated dc voltage is applied instead of ac to the primary of the transformer:
 - a. Secondary of transformer will burn
 - b. Primary of transformer will burn
 - c. Secondary voltage will be excessively high
 - d. There will be no secondary voltage

3. The efficiency of a power transformer can be determined indirectly by performing:
 - a. Open-circuit test
 - b. Short-circuit test
 - c. Both short-circuit and open-circuit tests
 - d. Back-to-back test

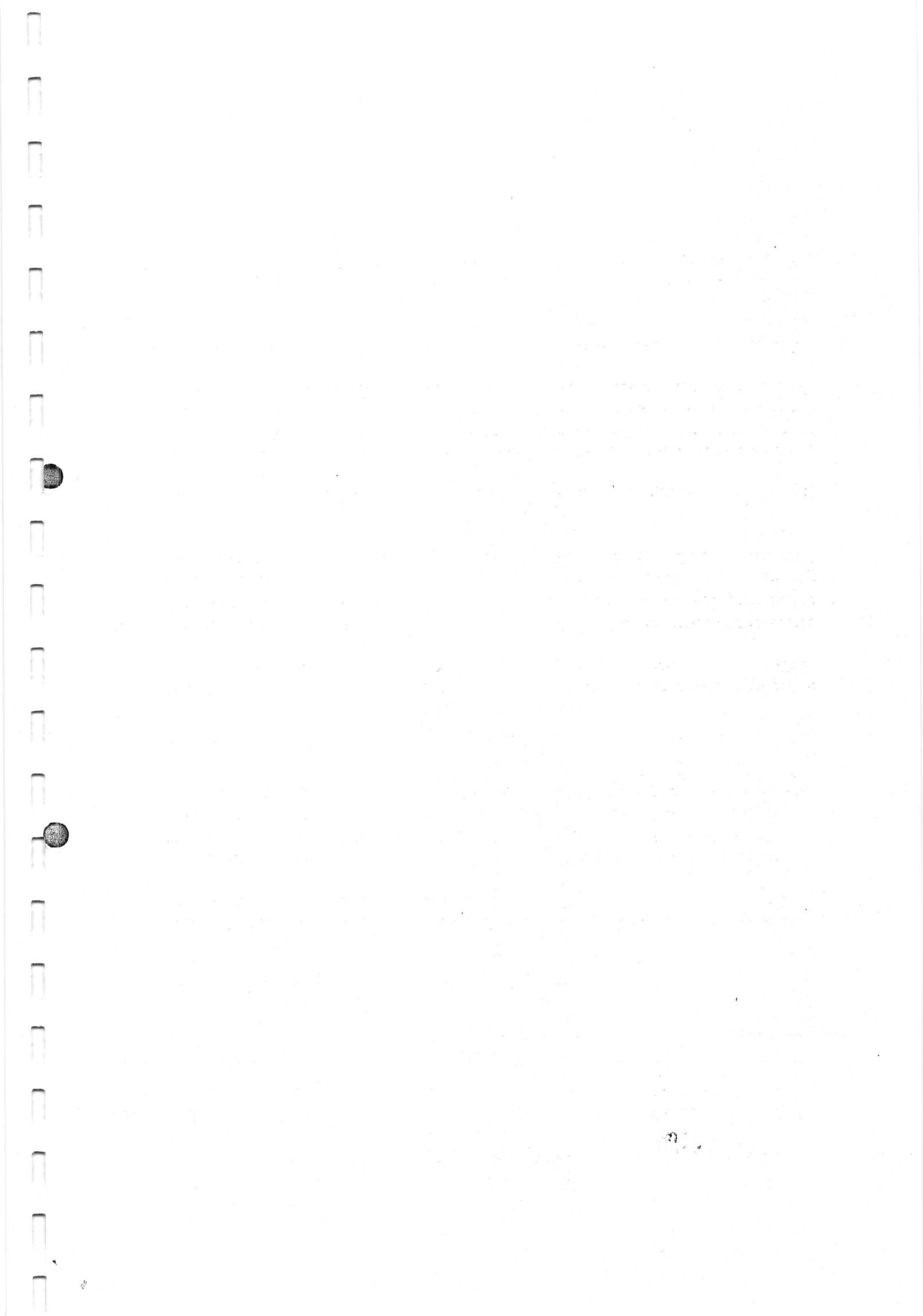
4. If the percentage resistance of a power transformer for secondary side is 2.5 percent and turn ratio is 1: 10, the percentage secondary resistance referred to primary will be:
 - a. 25
 - b. 2.5
 - c. 0.25
 - d. 0.025

5. The transformer efficiency, under heavy loads, is comparatively low due to:
 - a. Large increase in copper losses in comparison to the output
 - b. Large increase in iron losses
 - c. Drop in power factor
 - d. Decrease in input voltage

6. In electromechanical energy conversion devices (e.g. generator and motor), a small gap is left between stator and the rotor in order to:
 - a. Reduce the reluctance of the magnetic path
 - b. Increase flux density in the air gap
 - c. Permit mechanical clearance
 - d. Avoid saturation of field

7. EMF induced in a coil rotating in a uniform magnetic field will be maximum when the:
- Flux linking with the coil is maximum
 - Rate of change of flux linkage is minimum
 - Rate of change of flux linkage is maximum
 - Rate of cutting flux by the coil sides is minimum
8. Armature of a dc machine is made of silicon steel laminations to:
- Reduce hysteresis loss only
 - Reduce the eddy current losses only
 - Increase the permeability
 - Reduce both hysteresis and eddy current losses.
9. A 4-pole dynamo with wave wound armature has 51 slots containing 20 conductors in each slot. The induced emf is 357 V and the speed is 8500 rpm. The flux per pole will be:
- 3.5 mWb
 - 1.2 mWb
 - 14 mWb
 - 21 mWb
10. The direction of rotor current produced in an induction motor can be determined by:
- Lenz's Law
 - Induction Law
 - Fleming's right hand rules
 - Fleming's left hand rules
11. The frequency of rotor currents at standstill is equal to:
- Zero
 - $2f$
 - f
 - sf
12. The equivalent circuit per phase of a three phase transformer is similar to that of a three phase induction motor, but the transformer does not develop any torque. This is due to:
- Insufficient voltage
 - Low supply frequency
 - Non-fulfilment of condition of space condition of winding
 - No squirrel cage winding
13. The load currents in short-circuit calculation are neglected because
- Short-circuit current are much larger than load currents.
 - Short-circuit current are greatly out of phase with load currents.
- Which of these statement(s) is/are correct?
- Neither 1 nor 2
 - 2 alone
 - 1 alone
 - 1 and 2
14. The magnitude of fault current depends upon:
- Total impedance up to fault
 - Voltage at the fault point
 - Load current being supplied before occurrence of fault
 - Both (a) and (b)
15. In a circuit breaker the contact space is ionized by:
- Field emission from the contact surface
 - Thermal emission from the contact surface
 - Thermal ionization of gas
 - Direct connection of contacts

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 c. Double the original value
b. Half of original value d. One-fourth of original value
18. ACSR is used in place of copper in overhead lines because of:
a. Higher current carrying capacity c. Economy
b. Being lighter in weight d. Higher tensile strength
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% c. Reduced by 12.5%
b. Increased by 25% d. Remain unchanged
20. The ABCD constants of a 3-phase transmission line are $A = D = 0.8 \angle 1^\circ$, $B = 170 \angle 85^\circ \Omega$, $C = 0.002 \angle 90.4^\circ$ mho. The sending end voltage is 400 kV. The receiving end voltage under no load condition is:
a. 400 kV b. 500 kV c. 320 kV d. 417 kV



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SECTION "B"
[5 Q × 8 = 40 marks]

Attempt ANY FIVE questions. Assume any suitable data if necessary.

1.
 - a. What is Power System? In power system high voltage is used for long transmission line, and low and medium voltage for distribution line, why? [2+2]
 - b. A single-phase power system consists of a 440 V, 50 Hz generator that is connected to the load $Z_{load} = 5 + j4 \Omega$ through the transmission line with $Z_{line} = 0.2 + j 0.3 \Omega$. a) What is the voltage at the load? What are the transmission line losses? b) If a 1:15 step up transformer and a 20:1 step down transformer are placed at the generator and the load ends of the transmission line respectively, what are the new load voltage and the new transmission line losses? [4]
2.
 - a. Define the transformer efficiency with necessary mathematical expressions. Also derive an expression of the condition for maximum efficiency of transformer. [2+2]
 - b. A single phase step down transformer has a turn ratio of 3. The resistance and reactance of the primary winding are 1.2Ω and 6Ω and those of the secondary winding are 0.05Ω and 0.03Ω respectively. If the h.v. winding is supplied at 230 V, 50 Hz with l.v. winding short circuited, find: (i) Current in the l.v. winding; (ii) Copper loss in the transformer. [4]
3.
 - a. Describe the working principle of DC generator with necessary diagrams. [4]
 - b. A belt drive 60 kW shunt-wound generator running at 500 rpm is supplying full load to a bus bar at 200 V. At what speed will it run if the belt breaks and the machine continues to run taking 5 kW from the bus bar? The armature and field resistances are 0.1Ω and 100Ω respectively. Brush contact drop may be taken as 2 V. Neglect armature reaction. [4]
4.
 - a. Explain the characteristics of alternator with necessary figure and mathematical expressions. [4]
 - b. What do you understand by the term 'earthing'? Why are electrical equipment and appliances earthed? Explain the basic requirement of a good effective earthing system. [4]

5.

- a. A 2 wire feeder ABC has a load of 180 A at C and of 80A at B both at pf 0.8 lagging. The impedance AB is $(0.06 + j0.09) \Omega$ and that of BC is $(0.07 + j0.14) \Omega$. If the voltage at the far end C is to be maintained at 410 V, determine the voltage (i) at A and (ii) at B. [4]
- b. Derive an expression for the sag occurred in between two supports placed at different levels. Also explain the effect of ice on the sag. [4]

6. Write short note on the topics.

[2+2+2+2]

- a. Instrument Transformer
- b. Starting of synchronous machine
- c. Comparison between overhead and underground transmission line
- d. Fault clearing process of a Circuit Breakers.