KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.E.
Year : III

Course : CIEG 312
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 30 NOV 2023

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate option.

1. A transformer transforms
   a. frequency b. voltage c. current d. voltage and current

2. The equivalent resistance of the primary of a transformer having k=5 and R_1=0.1 ohm when referred to secondary becomes……ohm.
   a. 0.5 b. 0.02 c. 0.004 d. 2.5

3. Two transformers A and B having equal outputs and voltage ratios but unequal percentage impedances of 4 and 2 are operating in parallel. Transformer A will be running over-load by ……. %
   a. 50 b. 66 c. 33 d. 25.

4. Transformer cores are laminated in order to decrease ……
   a. iron loss b. eddy current loss
   c. cost d. magnetic hysteresis.

5. Which of the following is not a basic element of a transformer?
   a. Core b. Primary winding
   c. Secondary winding d. Mutual flux.

6. A wave winding must go at least…… around the armature before it closes back where it started.
   a. once b. twice c. thrice d. four times.

7. The critical resistance of the DC generator is the resistance of
   a. Armature b. Field c. Load d. Brushes.

8. Shunt generators are most suitable for stable parallel operation because of their…... voltage characteristics.
   a. identical b. dropping c. linear d. rising

9. In a d.c. generator, the generated emf is directly proportional to the
   a. field current b. pole flux
   c. number of a parallel path d. number of dummy coils.

10. The effect of increasing the length of air gap in an induction motor will be to increase the?
    a. Power factor
    b. Speed
    c. Magnetizing current.
    d. Air-gap flux

11. The magnetizing current drawn by transformers and induction motors is the cause of their ..... power factor.
    a. zero
    b. unity
    c. lagging
    d. leading

12. In a 3- phase induction motor, the relative speed of stator flux with respect to ..... is zero.
    a. stator winding
    b. rotor
    c. rotor flux
    d. space

13. The frequency of the voltage generated by an alternator having 4-poles and rotating at 1800 rpm is..... Hz.
    a. 60
    b. 7200
    c. 120
    d. 450

14. The power factor of an alternator is defined by its .....
    a. speed
    b. load
    c. excitation.
    d. prime mover

15. For proper parallel operation, a.c. polyphase alternators must have the same
    a. speed
    b. voltage rating
    c. kVA rating
    d. excitation

16. Zero power factor method of an alternator is used to find its .....
    a. efficiency
    b. voltage regulation
    c. armature resistance
    d. synchronous impedance

17. Load factor is always .....
    a. 1
    b. 0
    c. less than 1
    d. ∞

18. Aluminum is now most commonly employed conductor material in transmission line than copper because .....
    a. it is more conductive
    b. its tensile strength is more
    c. costlier
    d. it is cheaper and lighter

19. When active power demand increases, frequency.....
    a. increases
    b. decreases
    c. remains same
    d. cannot be determined

20. Overhead lines generally use ..... conductor.
    a. AAC
    b. ACSR
    c. copper
    d. steel

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Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : CIEG 312
Semester : II
F. M. : 40

SECTION "B"
[5 Q.× 8 = 40 marks]

Attempt *ANY FIVE* questions. Symbols have their usual meaning.

1.
a. Draw the diagram of basic structure of power system and explain each component. [4]
b. A single-phase transformer has 400 primary and 1000 secondary turns. The cross-sectional area of the core is 60 cm^2. If the primary winding be connected to a 50 Hz supply at 520 V, calculate the peak value of flux density in the core and the voltage induced in the secondary winding. [2+2]

2.
a. Explain in brief about parallel operation of transformer. What are the conditions that must be satisfied for parallel operation of transformer. [3]
b. The primary and secondary windings of a 30 kVA 6000/230 V, 1- phase transformer have resistance of 10 ohm and 0.016 ohm respectively. The reactance of the transformer referred to the primary is 34 ohm. Find the primary voltage required to circulate full-load current when secondary is short circuited. What is the power factor in short circuit? [5]

3.
a. Write in brief about self excited and separately excited DC generator. [2+2]
b. A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50 Ω and 0.03 Ω respectively. Calculate the generated emf. [4]

4.
a. What is synchronization? List out the conditions that must be satisfied for synchronization of alternators. [3]
b. A three phase, star connected, 1500 kVA, 13 kV alternator has armature winding resistance of 0.1 Ω per phase and synchronous reactance of 2.4 Ω per phase. If the alternator is supplying rated full load current at rated terminal voltage, calculate emf generated and voltage regulation at unity power factor. [3+2]

5.
a. List out the major types of insulators used in the overhead lines and explain in brief about these insulators. [3]
b. Show that economical voltage Veco=148.5 kV for P = 90MW, l=100km and N_C=1. Suggest why this voltage is not considered to be in design although it is economical? [5]

6.
a. Compute the power loss and voltage drop for a 15km long 11kV three phase distribution feeder having sending end current of 100A with uniformly distributed load, Use $z=0.6+3j\ \Omega/km$. Derive expression used in above calculation. [5]
b. Explain in brief about automatic voltage regulator (AVR) appropriate block diagram. [3]