KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

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

12 AUG 2024

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

SECTION "B"
[5 Q. × 8 = 40 marks]

Attempt ANY FIVE questions. Symbols have their usual meanings. Urgent appropriate assumptions are permissible. Marks are indicated inside brackets.

1.
a. With an appropriate diagram explain how electrical power reaches your home. [4]
b. Explain mathematically how voltage and impedance transformation occur in transformer. [2+2]

2.
a. A 25- kVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000 V, 50 Hz supply. Find the full-load primary and secondary currents, the secondary emf and the maximum flux in the core. Neglect leakage drops and no-load primary current. [3]
b. A transformer on no-load has a core-loss of 50 W, draws a current of 2 A (rms) and has an induced emf of 230 V (rms). Determine the no-load power factor, core-loss current and magnetizing current. Also calculate the no-load circuit parameters of the transformer. Neglect winding resistance and leakage flux. [5]

3.
a. With appropriate diagram explain the role of commutator and carbon brush in dc generator. [3]
b. A 250 V DC shunt motor has armature winding resistance of 0.4 Ω and field winding resistance of 0.5 Ω. It draws a current of 25A at half load and the corresponding speed is 1200 rpm. If the resistance of 50 Ω is connected in series with the field winding and the load torque is increased by 20% calculate the new speed. [5]

4.
a. A long shunt DC compound generator has R_a=0.5 Ω, R_v=1 Ω, R_f=1000 Ω and back emf produced is 220V at N=1500 rpm. If the field resistance is doubled and speed is reduced by 10%, calculate the emf generated on the generator and the value of load resistance. [3]
b. A three-phase, star connected, 1500 kVA, 13 kV alternator has an armature winding resistance of 0.1 Ω per phase and synchronous reactance of 2.4 Ω per phase. In each of the following cases, if the alternator is supplying rated full load current at rated terminal voltage, calculate the emf generated and voltage regulation at 0.8 lagging and 0.8 leading power factor. [5]

P.T.O.

5.

a. Derive the expression of a sag of transmission line when supports are at equal levels. [3]

b. Select the most economical and technically adequate voltage level and number of circuits for a transmission line to transmit 300MW of power over a distance of 200km. [5]

6.

a. Compute the power loss and voltage drop for a 10km long 11kV three phase distribution feeder having sending end current of 100A with uniformly distributed load, Use z=0.4+0.3j Ω/km. [4]

b. How is frequency and voltage controlled in the power plant? Explain with appropriate block diagram. [4]

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Marks Scored:

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F. M. : 10

Registration No.:

Date :

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

1. The main purpose of using core in a transformer is to
   a. decrease iron losses
   b. prevent eddy current loss
   c. eliminate magnetic hysteresis
   d. decrease reluctance of common magnetic circuit.

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

3. Which of the following connections is best suited for 3-phase, 4-wire service?
   a. $\Delta - \Delta$ b. $Y - Y$ c. $\Delta - Y$ d. $Y - \Delta$.

4. Transformer cores are laminated in order to
   a. simplify construction
   b. minimize eddy current loss
   c. reduce cost
   d. reduce hysteresis loss.

5. In an ideal transformer?
   a. winding have no resistance
   b. core has no losses
   c. core has infinite permeability
   d. mutual flux.

6. The current drawn by a 120 V dc motor of armature resistance 0.5 Ω and back emf 110V is _____ A.
   a. 20 b. 240 c. 220 d. 5.

7. A dc motor develops a torque of 200 N-m at 25 rps. At 200 rps it will develop a torque of _____ N-m.
   a. 200 b. 160 c. 250 d. 128.

8. The maximum torque of dc motor is limited by.
   a. commutation b. heating c. speed d. armature current

9. Lap winding is suitable for _____ current, _____ voltage dc generators.
   a. high, low b. low, high c. low, low d. high, high.

10. In 3ϕ induction motor, the rotor field rotates at synchronous speed with respect to
    a. rotor b. stator c. stator flux d. saft

11. The efficiency of a 3ϕ induction motor is approximately proportional to
a. N b. s c. (1-s) d. N_s

12. A 6-pole, 50 Hz, 3ϕ induction motor has a full load speed of 950 rpm. At half load, its speed would be ..... rpm.
a. 475 b. 500 c. 975 d. 1000

13. When the speed of an alternator is changed from 3600 rpm to 1800 rpm, the generated emf/phase will become.
a. one half b. twice c. four times d. one-fourth

14. A 50 Hz alternator will run at the greatest possible speed if it is wounded for _____ poles.
a. 8 b. 6 c. 4 d. 2

15. For a machine on an infinite bus active power can be varied by
a. changing field excitation b. changing prime mover speed
c. both a and b d. none of the above.

16. The power factor of an alternator is determined by its
c. speed b. load c. excitation d. prime mover

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

18. Pin type insulators are used for transmission lines
c. below 33 kV. b. above 33 kV. c. up to 33 kV. d. up to 66 kV.

19. When reactive power is not enough, voltage _____
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