KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. E.
Year : III

Course : CIEG 312
Semester : II

Exam Roll No. :

Time: 30 min

F. M. : 10

Registration No.:

Date SEP 03 2017

SECTION "A"

[20 Q × 0.5 = 10 marks]

Choose the most appropriate answer.

1. No-load test on transformer is carried out to determine
   a. copper loss
   b. magnetizing current
   c. magnetizing current and no load loss
   d. efficiency of transformer

2. The efficiency of transformer will be maximum when
   a. Copper loss = hysteresis loss
   b. Hysteresis loss = eddy current loss
   c. Eddy current loss = copper loss
   d. Copper loss = iron loss

3. The full load copper loss of a transformer is 1600 W. At half load the copper loss will be
   a. 6400 W
   b. 1600 W
   c. 800 W
   d. 400 W

4. For parallel operation of single phase transformer it is necessary that they should have
   a. Same efficiency
   b. Same polarity
   c. Same kVA rating
   d. Same number of turns in primary and secondary

5. If field current is decreased in shunt dc motor, the speed of the motor
   a. Increases
   b. Decreases
   c. Remains same
   d. Oscillates

6. In DC machine yoke offers
   a. Mechanical protection for machine
   b. Flux path completion
   c. Produce working flux
   d. Both a and b

7. The current drawn by the a 230 V DC motor of armature resistance 0.5 Ω and back emf 200 V is
   a. 60 A
   b. 40 A
   c. 30 A
   d. 20 A

8. What is the increase in the torque expressed as percentage of initial torque, if current drawn by the dc series motor is increased from 10 A to 11 A?
   a. 11%
   b. 21%
   c. 10%
   d. 41%

9. What is/are the necessary conditions for parallel operation of alternators?
   a. Terminal voltage should be same
   b. Efficiency should be same
   c. Speed of alternators should be same
   d. kVA rating should be same

10. When pure inductive load is connected to alternator, what is the effect of armature reaction?
   a. Cross magnetizing
   b. De magnetizing
   c. Magnetizing
   d. Both a and c

11. Find the synchronous reactance of an alternator for which the field current is 200 A when short circuited and the generated emf is 50 V when open circuited. Assume the armature resistance to be 0.1 ohm.
a. 0.23 ohm b. 0.25 ohm c. 0.5 ohm d. 1 ohm

12. A three phase 4 pole 50 Hz induction motor is running at 1455 r.p.m. Find the slip speed and slip.
a. 45 rpm, 3% b. 54 rpm, 4% c. 45 rpm, 4% d. 40 rpm, 5%

13. The desirable characteristic of fuse wire is
a. Low Conductivity b. Low thermal expansion
c. Low melting point d. High specific resistance

14. If the fault current is 2000 A, the relay setting is 50% and CT ratio is 400: 5, then plug-setting multiplier will be
a. 10 b. 15 c. 20 d. 25

15. Isolator in substation is open under ---------- condition.
a. No load b. Short circuit c. Full load d. Both a and c

16. What is the preferred type of circuit breaker (CB) to be installed in extra high voltage AC system?
a. Bulk Oil CB b. Vacuum CB c. Air Blast d. SF6 CB

17. Advantages of higher transmission voltage is/are:
a. Power transfer capability is increased
b. Transmission line losses are reduced
c. Area of cross section of conductor are increased
d. Both a and b

18. If 100 MW of power is to be transferred over a distance of 200 km, the optimum line voltage is
a. 220 kV b. 11 kV c. 66 kV d. 132 kV

19. Which of the following statements is true? Corona loss increases with:
a. decrease in conductor size and decrease in supply frequency
b. increase in conductor size and decrease in supply frequency
c. decrease in conductor size and increase in supply frequency
d. increase in conductor size and increase in frequency

20. If the span between two towers is doubled keeping other things unchanged, the sag will be
a. double the initial value b. unchanged
c. half the initial value d. four times the initial value

KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

SEP 03 2017

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

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

SECTION "B"

Attempt *ANY FIVE* questions. Symbols have their usual meanings. Appropriate assumptions are permissible. Marks are indicated inside [ ].

1. a. Obtain the approximate equivalent circuit of a given 400/200 V single phase 4 kVA transformer referred to 200 V side having following test results [4]
   O.C test: 200 V, 1 A, 64 W on low voltage side
   S.C test: 15 V, 10 A, 80 W on high voltage side
   b. A single-phase 100 kVA transformer has an efficiency of 95% on full load at 0.8 power factor and on half of full load at 0.8 power factor. Find (i)Iron Loss and (ii) Full load copper loss for the transformer. [4]

2. a. A 220 V dc series motor series motor has armature and field resistances of 0.15 Ω and 0.10 Ω respectively. It takes a current of 30 A from the supply while running at 1000 rpm. If an external resistance of 1 Ω is inserted in series with the motor, calculate the new steady state armature current and the speed. Assume the load torque remains constant. [3]
   b. Describe different methods of speed control of d.c. motor. [3]
   c. Describe the voltage build up process in dc shunt generator. [2]

3. a. Explain how an induction motor can be operated as an induction generator with an appropriate diagram. [2]
   b. A 3-phase star connected synchronous generator rated at 1500 kVA, 12 kV. The armature effective resistance and synchronous reactance are 2 ohm and 35 ohm respectively per phase. Calculate the percentage voltage regulation for load of 1200 kW at (i) 0.8 pf lagging (ii) 0.8 pf leading [4]
   c. Describe the conditions that needs to be satisfied for parallel operation of two synchronous generators. [2]

4. a. Point out the difference between fuse and circuit breaker. [2]
   b. Explain the working principle of a SF6 circuit breaker. [3]
   c. Explain working mechanism of a Buchholz relay. [3]

5. a. Describe different factors that affect corona discharge on a transmission line. [2]
   b. A 2-conductor cable 1 km long is required to supply a constant current of 200 A throughout the year. The cost of cable including installation is Rs. (20 a + 20) per meter where 'a' is the area of X-section of the conductor in cm^2. The cost of energy is 5Paisa per kWh and interest and depreciation charges amount to 10%. Calculate the most economical conductor size. Assume resistivity of conductor material to be 1.73μ Ω cm. [3]

   c. The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, find the minimum clearance of the conductor and water and the clearance mid-way between the supports. Weight of conductor is 1.5 kg/m. Bases of the towers is to be considered at water level. [3]

6. a. Derive the condition for the maximum efficiency of transformer. [3]

b. A 480-V, 60 Hz, 50-hp, three-phase induction motor is drawing 60A at 0.85 PF lagging. The stator copper losses are 2 kW, and the rotor copper losses are 700 W. The friction and windage losses are 600 W, the core losses are 1800 W, and the stray losses are negligible. Find the following quantities: air-gap power P_{AG}, power converted $P_{conv.}$, Output power P_{out}, efficiency of the motor. [3]

c. A generating station has a connected load of 43MW and a maximum demand of 20 MW; the units generated being $61{\cdot}5 \times 10^6$ per annum. Calculate (i) the demand factor and (ii) load factor of the system. [2]