

KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2019

Marks scored:

Level : B.E.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : EEEG 215

Semester: II

F. M. : 10

Registration No.:

Date : JAN 04 2019

SECTION "A"

[20 Q × 0.5 = 10 marks]

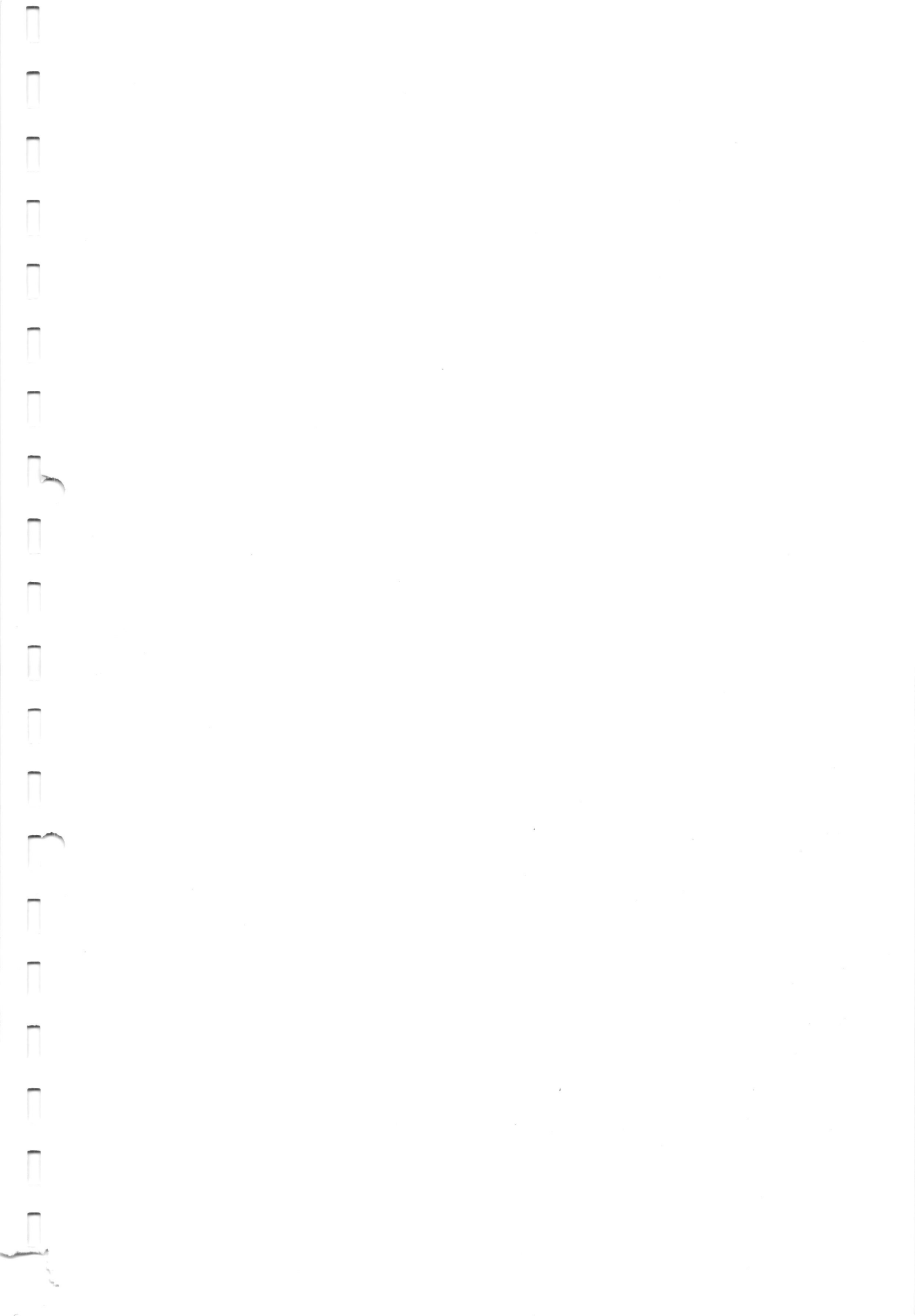
Choose the most appropriate answer.

- Two transformers A and B, with identical ratings, are to be designed with flux densities of 1.2 and 1.4 Wb/m² respectively. The weight of transformer A per KVA is
 - Less than that of transformer B.
 - More than that of transformer B.
 - Equal to that of transformer B.
 - One half of that of transformer B.
- In a single phase transformer with subscripts 1 and 2 for primary and secondary windings respectively,
 - $E_1N_2 = E_2N_1$ and $I_1N_1 = I_2N_2$.
 - $E_1N_1 = E_2N_2$ and $I_1N_1 = I_2N_2$.
 - $E_1N_2 = E_2N_1$ and $I_1N_2 = I_2N_1$.
 - $E_1N_1 = E_2N_2$ and $I_1N_2 = I_2N_1$.
- The flux involved in the e.m.f equation of a transformer has
 - r.m.s value.
 - Average value.
 - Total value.
 - Maximum value.
- A transformer having 1000 primary turns is connected to a 250V ac supply. For a secondary voltage of 400 V, the number of secondary turns should be
 - 1600.
 - 250.
 - 400.
 - 1250.
- The equivalent resistance of primary of a transformer having transformation ratio equal to 5 and primary resistance equal to 0.1 Ohm when referred to secondary becomes
 - 0.5 Ohm.
 - 0.02 Ohm.
 - 0.004 Ohm.
 - 2.5 Ohm.
- When a 400 Hz transformer is operated at 50 Hz, its KVA rating is
 - Reduced to 1/8th.
 - Increased to 8 times.
 - Unaffected.
 - Increased 64 times.
- One 200 V, 100W bulb is connected in series with the primary of a 200 V, 10 kVA transformer. If its secondary is left open circuited, then the bulb would have
 - Full brightness.
 - Poor brightness.
 - A little bit less than full brightness.
 - More than full brightness.
- In d.c machine, the armature windings are placed on the rotor because of the necessity for
 - Electromechanical energy conversion.
 - Generation of voltage.
 - Commutation.
 - Development of torque.

9. In d.c machines the space distribution of air gap flux density wave at no load is
- Sinusoidal.
 - Rectangular.
 - Flat topped.
 - Triangular.
10. In d.c generators, the effect of armature m.m.f on the main pole flux distribution is to
- Distort it.
 - Produce no distortion.
 - Shift the zero crossing of the resultant flux density wave in the direction of rotation.
 - Shift the zero crossing of resultant flux density wave against the direction of rotation.
11. A d.c shunt motor draws an armature current of I_a amperes under normal rated conditions. For constant power output, if both the field flux and armature terminal voltage are halved, then the armature current becomes
- I_a .
 - $2I_a$.
 - $\frac{1}{2}I_a$.
 - $4I_a$.
12. In Swinburne's method of testing d.c machines, the shunt machine is run as
- Motor at full load.
 - Generator at full load.
 - Motor at no load.
 - Generator at no load.
13. In Hopkinson's method of testing d.c machines, the power taken from the mains has to supply
- The losses in the motor only.
 - The losses in both the machines.
 - The input to both the machines.
 - The input to the motor and not to the generator.
14. Two d.c machines A and B have armature circuit resistances of 0.4Ω and 1.2Ω respectively. In these two machines
- A is bigger than B for the same current rating.
 - A is bigger than B for same voltage rating.
 - A is bigger than B for same voltage rating.
 - Both the machines are of the same size for the same current rating.
15. A d.c shunt motor is started at no load and its rated speed is noted as 1000 rpm. After 5 hours of continuous no load running, its speed would
- Become more than 1000 rpm.
 - Become less than 1000 rpm.
 - Remain 1000 rpm.
 - Reduce to 800 rpm.
16. The volt ampere equation for a long shunt compound motor is given by
- $V_t = E_a + I_a r_a$.
 - $V_t = E_a - I_a r_a$.
 - $V_t = E_a + I_a r_a + I_L r_s$.
 - $V_t = E_a + I_a (r_a + r_s)$.
17. The armature core of a d.c machine is laminated to minimize
- Hysteresis loss.
 - Eddy current loss.
 - Copper loss.
 - Temperature rise.
18. A synchronous machine has its field winding on the rotor and armature winding on the stator. When running under steady conditions, its air gap field is
- Stationary with respect to stator.
 - Stationary with respect to rotor.
 - Rotating at synchronous speed with respect to stator.
 - Rotating at synchronous speed in the direction of rotor rotation.

JAN 04 2019

19. The maximum possible speeds in r.p.m at which a 2 pole alternator can be driven to generate voltage at 60 Hz and 50 Hz are respectively
- a. 2000, 2400.
 - b. 3000, 3600.
 - c. 2400, 2000.
 - d. 3600, 3000.
20. Rotor slots of squirrel cage induction motor are skewed slightly, so as to
- a. Increase the mechanical strength of rotor.
 - b. Make the rotor construction simpler.
 - c. Eliminate the locking tendency of the rotor.
 - d. Save the amount of copper required.



KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2019

JAN 04 2019

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

Course : EEEG 215
Semester: II
F. M. : 40

SECTION "B"
[5 Q.×8=40 marks]

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

- 1.
- a. A 2200/220 V, 50 Hz, single phase transformer has exciting current of 0.6 A and a core loss of 361 Watts, when its high voltage side is energized at rated voltage. Calculate the two components of the exciting current. [2]
- b. A 33 kVA, 2200/220 V 50 Hz single phase transformer has the following parameters:
Primary winding – resistance, $R_1 = 2.4\Omega$; leakage reactance, $X_1 = 6\Omega$.
Secondary winding – resistance, $R_2 = 0.03\Omega$; leakage reactance, $X_2 = 0.07\Omega$.
- i. Find the equivalent resistance and equivalent leakage reactance referred to secondary.
- ii. Calculate the ohmic loss at full load.
- iii. Calculate the voltage to be applied to the high voltage side in order to obtain a short circuit current of 160 A in the low voltage winding. [1+1+1=3]
- c. Explain the short circuit test and open circuit test of a three phase transformer. [3]
- 2.
- a. A 20 kVA, 2500/250 V, single phase transformer has equivalent leakage impedance of $Z_H = 2.6 + j 4.3 \Omega$ when referred to the high voltage side.
- i. Find the per unit value of Z_H referred to the high voltage side.
- ii. If the transformer has an exciting current of 4.8 A on high voltage side, find its per unit value on the low voltage side. [1+1= 2]
- b. List out the advantages and disadvantages of autotransformer over two winding transformer. [2]
- c. A 5 kVA, single phase transformer has a core loss of 40 Watts and a full load ohmic loss of 100 Watts. The daily variation of load on the transformer is as follows in Table 1. Determine the all-day efficiency of the transformer. [4]

Table 1. Load variation on daily basis for 5kVA transformer

Time	Load	Power factor
7 a.m to 1 p.m	3 kW	0.6
1 p.m to 6 p.m	2 kW	0.8
6 p.m to 1 a.m	6 kW	0.9
1 a.m to 7 a.m	No load	

- 3.
- a. Obtain a developed diagram for a 4 pole d.c machine with simple progressive lap winding suitable for an armature containing 12 slots. Assume single turn coil with two conductors per slot. [6]
 - b. Derive the e.m.f equation of a d.c machine. [2]
- 4.
- a. Describe Hopkinson's method of testing of a dc machine. [3]
 - b. A 4 pole wave wound dc machine running at 1500 rpm has a commutator of 35 cm diameter. If armature current is 150 A, thickness of brush 1.05cm and a self-inductance of each armature coil is 0.06 mH, calculate the average e.m.f induced in each coil during commutation. Assume linear commutation. [2]
 - c. Derive the expression for a torque developed in a d.c machine. [3]
- 5.
- a. Explain the action of commutator in a d.c machine. [4]
 - b. A 230 V, d.c shunt motor takes an armature current of 3.33 A at rated voltage and at a no load speed of 1000 r.p.m. the resistances of the armature circuit and field circuit are respectively 0.3Ω and 160Ω . The line current at full load and rated voltage is 40A. Calculate at full load,
 - i. The speed and,
 - ii. The developed torque in case the armature weakens the no load flux by 4%. [2+2=4]
- 6.
- a. Explain the construction and working principle of an alternator [3]
 - b. Explain graphically the speed torque characteristic curves of a dc shunt motor. [2]
 - c. Explain the four point starting method of a dc machine. [3]