KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.E.
Year : II

Course : EEEG 215
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 20 FEB 2025

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate answer. Symbols have their usual meanings.

1. The action of transformer operates on _____ flux.
   a. Alternating electric
   b. Alternating magnetic
   c. Constant magnetic
   d. Constant electric

2. The primary winding of a transformer.
   a. Is always a high voltage winding
   b. Is always a low voltage winding
   c. Depends upon the number of turns
   d. Depends upon the supply voltage

3. In a single phase transformer with subscripts 'A' and 'B' for primary and secondary windings respectively,
   a. $E_AN_B = E_BN_A$ and $I_AN_A = I_BN_B$
   b. $E_AN_A = E_BN_B$ and $I_AN_A = I_BN_B$
   c. $E_AN_B = E_BN_A$ and $I_AN_B = I_BN_A$
   d. $E_AN_A = E_BN_B$ and $I_AN_B = I_BN_A$

4. The flux involved in the e.m.f equation of a transformer has
   a. R.M.S value
   b. Average value
   c. Total value
   d. Maximum value

5. The full load copper loss of a transformer is 1600 Watts. At half load, the copper loss will be _____ Watts.
   a. 1600
   b. 6400
   c. 400
   d. 800

6. The main advantage of an autotransformer over a two winding transformer is
   a. Eddy losses are totally eliminated
   b. Copper losses are negligible
   c. Saving in winding material
   d. Hysteresis losses are reduced

7. The voltage regulation of a transformer for no load emf, E2 and full load terminal voltage V2 is given by
   a. $\frac{V2-E2}{V2}$
   b. $\frac{V2-E2}{E2}$
   c. $\frac{E2-V2}{V2}$
   d. $\frac{E2-V2}{E2}$

8. The iron loss will _____ If the supply frequency to the transformer is _____
   a. Increase, decrease
   b. Increase, increase
   c. Decrease, increase
   d. Constant, increase

9. The losses which occur in a rotating electric machine and do not occur in transformer are
   a. Friction and windage losses
   b. Magnetic losses.
   c. Hysteresis and eddy current losses
   d. Copper losses

10. For an open circuit test on transformer is conducted with _____
    a. Primary is supplied with rated voltage
    b. Low voltage side is supplied with rated voltage
    c. High voltage side is supplied rated voltage
    d. High voltage side is supplied with full load current

11. When a short circuit test on a transformer is performed at 25 V, 50 Hz, the drawn current is I_1. If the test is performed by 25 V and 25 Hz and power drawn current is I_2, then
    a. $I_1 > I_2$ b. $I_1 < I_2$ c. $I_1 = I_2$ d. No current flows

12. The purpose of providing dummy coil in a generator is
    a. To enhance flux density
    b. To amplify voltage
    c. To provide mechanical balance for the rotor
    d. To reduce eddy current

13. In a DC generator the magnetic neutral axis coincides with the geometrical neutral axis when
    a. There is no load on the generator.
    b. The generator runs on full load
    c. The generator runs on overload
    d. The generator runs on designed speed

14. Interpoles in dc machines are excited with
    a. Armature current
    b. Field current
    c. Load current
    d. Source current

15. The brushes in a DC generator are placed _____ to achieve sparkles commutation.
    a. Just ahead of magnetic neutral axis
    b. In magnetic neutral axis
    c. Just behind the magnetic neutral axis
    d. Can be placed anywhere

16. External characteristic for a DC generator is a plot of
    a. Generated emf and load current
    b. Terminal voltage and load current
    c. Generated voltage and field currentd. Armature current and field current

17. The methods is likely to result in reduction of hysteresis loss in a DC generator is
    a. Providing laminations in armature core
    b. Providing lamination in stator
    c. Using non magnetic materials for frame
    d. Using material of low hysteresis co-efficient for armature core material

18. The condition for maximum power in case of a DC motor is
    a. Back emf = 2 x supply voltage
    b. Back emf = half x supply voltage
    c. Supply voltage = half x back emf
    d. Supply voltage = back emf

19. The volt ampere equation for a long shunt compound motor is given by
    a. $V_t = E_b + I_a * r_a$
    b. $V_t = E_b - I_a * r_a$
    c. $V_t = E_b + I_a * r_a + I_L * r_s$
    d. $V_t = E_b + I_a(r_a + r_s)$

20. If T_a be the torque and I_a the armature current for a series DC motor, then the condition before saturation is
    a. Torque is directly proportion to armature current
    b. Torque is inversely proportional to armature current
    c. Torque is directly proportion to square of armature current
    d. Torque is directly proportion to square root of armature current

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

SECTION "B"
[4 Q. × 10 = 40 marks]

Attempt *ANY FOUR* questions. Assume any suitable data if required.

1.

a. A 100 KVA, single phase, 1100/220 V, 60 Hz transformer has a high voltage resistance of 0.1 Ω and a leakage reactance of 0.3 Ω. The low voltage winding resistance is 0.004 Ω and the leakage reactance is 0.012 Ω. Determine the [3]
   i. equivalent winding resistance and reactance referred to the low voltage side.
   ii. equivalent winding resistance and reactance referred to the high voltage side.

b. Explain the open circuit test and short circuit test of a single phase transformer. Why transformers are rated in KVA? Why the transformer does produce the "humming" sound? [4]

c. Obtain the approximate equivalent circuit of a given 2400/120 V single phase 50 kVA transformer having the following test results: [3]

   Open circuit test: 120V, 9.65A, 396W on low voltage side

   Short circuit test: 92V, 20.8A, 810W on high voltage side

   Determine the
   i. circuit constants
   ii. efficiency at full load, 0.8 power factor lagging
   iii. the approximate voltage regulation

2.

a. A 400/100, 5KVA two winding transformer is to be used as an autotransformer to supply power at 400V from 500V source. Draw the connection diagram and determine the KVA output of the transformer. [3]

b. Describe the method of parallel operation of two single phase transformers considering equal voltage ratios. Obtain the equations for load shard by the two transformers. [3]

c. A 400 KVA load at 0.7 pf lagging is supplied by three single phase transformers connected in Δ-Δ. Each of the Δ-Δ transformers is rated at 200 KVA, 2300/230 V. if one defective transformer is removed from the service, calculate for the V-V connection: [4]
   i. The KVA load carried by each transformer
   ii. Percent rated load carried by each transformer
   iii. Total KVA rating of the transformer bank in V-V
   iv. Ratio of V-V bank to Δ-Δ bank transformer ratings

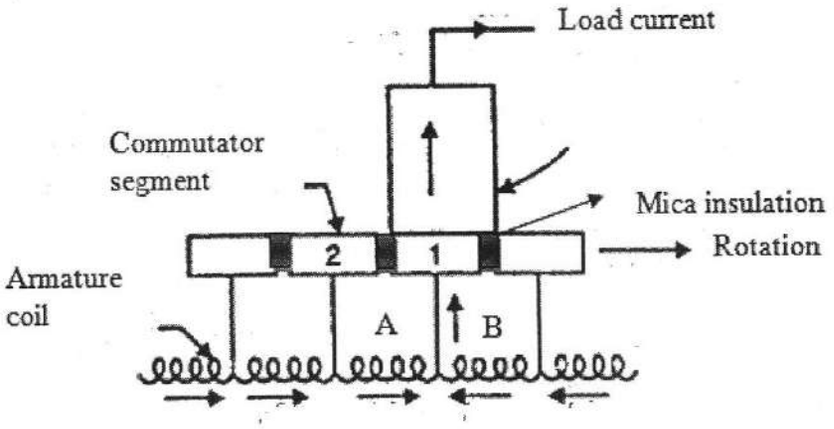
P.T.O.

3.

a. Explain the armature reaction in a dc generator under no load and on full load conditions. Illustrate with a phasor diagram the effects of armature reaction on the magnetic neutral axis and main flux and armature flux distribution. [4]

b. How is demagnetizing and cross-magnetizing ampere-turns/pole in a DC machine calculated? [3]

c. Explain the phenomenon of commutation in a dc machine for the coil sides A and B as shown in figure below by assuming load current of a suitable value in amperes and indicate current flowing through the coil sides A and B during commutation period.[3]



4.

a. A shunt generator give full load output of 30 kW at a terminal voltage of 200 V. the armature and shunt filed resistances are 0.05Ω and 50Ω respectively. The iron and friction losses are 1000 W. Calculate [3]
   i. Generated emf
   ii. Copper losses
   iii. Efficiency

b. Two DC shunt generators are running in parallel and supply a total load of 420 kW. The terminal voltage of generator 1 falls from 500V at no load to 465 V when delivering a current of 610 A; for the generator 2 the figures are 505 V at no load and 465 V at 380 A. determine [4]
   i. Common bus bas voltage, "V"
   ii. Current delivered by each machines

c. Obtain a developed winding table and equivalent ring diagram of a 4 pole wave connected armature having 30 coil sides. [3]

5.

a. A 6 pole lap connected DC generator having a commutator ring of diameter 45 cm runs at 1000 r.p.m. the brush width is 2 cm and thickness of mica insulation is 0.2 cm. the load current delivered by the generator is 115 A and the shunt field current is 5 A. the self inductance of each coil is 0.1 mH. Determine the reactance voltage for a linear commutation. [3]

b. Explain the armature voltage and, field flux methods of speed control of a dc motor.[3]

c. A shunt motor runs at 600 r.p.m from 250 V supply and takes a line current of 50A. Its armature field resistances are 0.4Ω and 125Ω respectively. Neglecting the effects of armature reaction and allowing 2V brush drop. Calculate [4]

i. The no load speed if the no load line current is 5A

ii. The percentage reduction in flux per pole in order that the speed may be 800 r.p.m when the armature current is 800A.