BHARATHIDASAN ENGINEERING COLLEGE
NATTRAMPALLI- 635 854
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EE 3303 ELECTRICAL MACHINES -1 UPDATED FAQ

UNIT-1 ELECTROMECHANICAL ENERGY CONVERSION

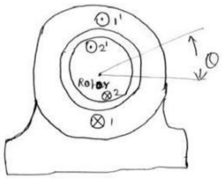
Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi excited magnetic field system mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines- magnetic saturation and leakage fluxes. Introduction to Indian StandardSpecifications (ISS) - Role and significance in testing.

PART-A

1. Distinguish between statically and dynamically induced electromotive force.
2. Define the term self-inductance. **NOV/DEC 2017**
3. What is fringing effect? **NOV/DEC 2018**
4. What is stacking factor?
5. Define Torque.
6. Define relative permeability. **ARP/MAY 2017**
7. Define magnetic flux density. **NOV/DEC 2017**
8. Define co-energy.
9. Write the expression for energy in terms of λ1, λ2, θ for doubly excited system.
10. Write an expression for the stored energy in the magnetic field.
11. Draw the general block diagram of electromechanical energy conversion device.
12. Based on the principle of conservation of energy, write an energy balance equation for amotor.
13. What are the three principles for the electromechanical energy conversion? **NOV/DEC2017, (APR/MAY 2023)**
    State examples of singly excited system.
14. Draw a single excited magnetic system.
15. Draw a double excited magnetic system
16. What are distributed windings?
17. Write the relation between electrical and mechanical degree.
18. State the principle of conversion of energy. **NOV/DEC 2018**
19. Write down the expression for reluctance. What is its unit? **ARP/MAY 2019**
20. What are the categories of electromechanical energy conversion devices? **ARP/MAY 2019**
21. Give an example of single and double excited system. **NOV/DEC 2019**
22. Write the relationship between reluctance and magneto motive force. **NOV/DEC 2020**
23. What are the drawbacks of magnetic saturation? **NOV/DEC 2020**
24. Write the properties of magnetic lines of force. **NOV/DEC 2021**
25. Draw the characteristics between the flux linkage ‘ λ ’ and current of a magnetic circuit involved in electromechanical energy conversion process. Also locate energy and co- energy **NOV/DEC 2021**

26. For the electromechanical device shown in Figure 6, find the value of mutual inductancebetween stator and rotor **NOV/DEC 2021**

27. Why it is named as leakage flux? **(APR/MAY 2023)**

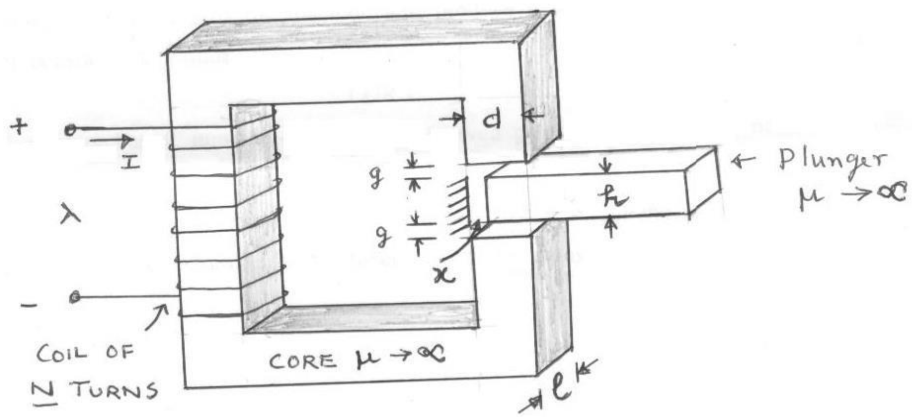


28. State Faraday's law of electro magnetic induction? **(NOV/DEC 2023)**

29. Define Fringe? **(NOV/DEC 2023)**

PART-B

1. Explain clearly the statically and dynamically induced EMF. **(NOV/DEC 2023)**
2. The core of an electromagnet is made of an iron rod of 1cm diameter, bent in to a circle ofmean diameter 10cm, a radial air gap of 1mm being left between the ends of the rod. Calculate the direct current needed in coil of 2000 turns uniformly spaced around the core to produce a magnetic flux of 0.2mwb in the air gap. Assume that the relative permeabilityof the iron is 150, that the magnetic leakage factor is 1.2 and that the airgap is parallel. **ARP/MAY 2017**
3. Draw and explain the typical magnetic circuit with air-gap and its equivalent electric circuit. Hence derive the expression for air gap flux. **NOV/DEC 2017**
4. An iron rod 1.8cm diameter is bent to form a ring of mean diameter 25 cm and wound with 250 turns wire. A gap of 1mm exists in between the end faces. Calculate the current requiredto produce a flux of 0.6 mWb. Take relative permeability of iron as 1200**. ARP/MAY 2020**
5. A ring has a diameter of 24cm and a cross sectional area of $1000mm^2$. The ring is made up of semicircular section of cast iron and cast steel with each joint having a reluctance equalto an airgap of 0.2mm. find the ampere turns required to produce a flux of $8x10^{-4}$ Wb. Therelative permeability of the cast steel and cast iron are 900 and 170 respectively neglect fringing and leakage effects. **NOV/DEC 2018**
6. The relay shown in Figure below is made from infinitely permeable magnetic material with a movable plunger also of infinitely permeable material. The height of the plunger is much greater than the air gap length (h >> g). Calculate the magnetic energy stored as a function of plunger position (0 < x < d) for N=1000 turns, g = 2.0 mm, d=0. 5 m, l = 0.1 m and I = 10 A.



7. Discuss in detail the production of mechanical force for an attracted armature relay excitedby an

electric source. **NOV/DEC 2017, (APR/MAY 2023)**

8. Obtain the expression for the mechanical force of field origin in a typical attracted armaturerelay. **(APR/MAY 2023)**

9. Find the expression for the magnetic force developed in a doubly excited magnetic systems. **(APR/MAY 2023) (NOV/DEC 2023)**

10. Find an expression for the magnetic force developed in multiply excited magnetic systems. **NOV/DEC 2019**

11. Explain the concept of rotating magnetic field.

12. Explain the concept of electromechanical energy conversion with neat diagram. **ARP/MAY 2017**

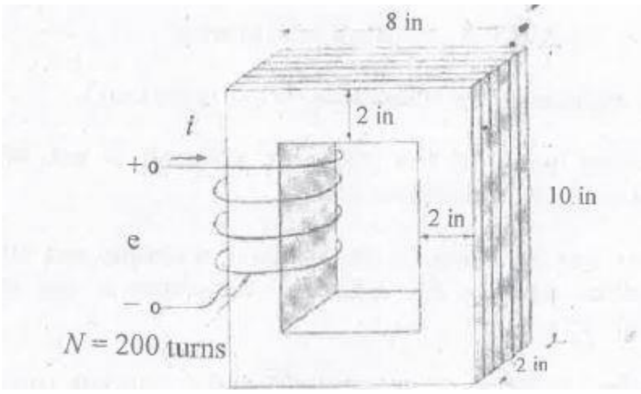
13. Explain in detailed MMF distribution in AC synchronous machine and derive the expression for fundamental MMF. **ARP/MAY 2017**

14. Consider an attracted armature relay is excited by an electric source. Expalin about the mechanical force developed and mechanical energy output with necessary equations for thelinear and non linear cases. **ARP/MAY 2018**

15. A magnetic core is shown below is made from laminations of M-5 grain orientation electrical steel. The winding is excited with a 60Hz voltage to produce a flux density in thesteel of B=1.5 sinwt T ,where w=2π60 rad/sec. the steel occupies 0.94 of the core cross sectional area. The mass density of the steel is 7.65g/cm^3. Find

i. The applied voltage
ii. The peak current
iii. The rms exciting current
iv. The core loss

The magnetic field intensity corresponding to Bmax=1.5T is Hmax=36A turns/m



16. Define dynamically induced EMF and derive it(5). **NOV/DEC 2019**

17. Explain AC operation of magnetic circuit.(5) **NOV/DEC 2019**

18. A flux density of 1.2wb/m^2 is required in 1mm air gap of an electromagnet having an ironpath of 1.5m long. Calculate the mmf required. Given the relative permeability of iron =1600.(8) **NOV/DEC 2019**

19. Draw the mmf pattern of a distributed single phase winding in a three phase machine. Number of slots for a single phase winding can be considered as 6 and number of conductors per slot are two. **NOV/DEC 2020**

20. Derive an expression for energy and co-energy of a doubly excited system **NOV/DEC 2020**

21. The magnetic circuit of Figure 1 has cast steel core with dimensions as shown :

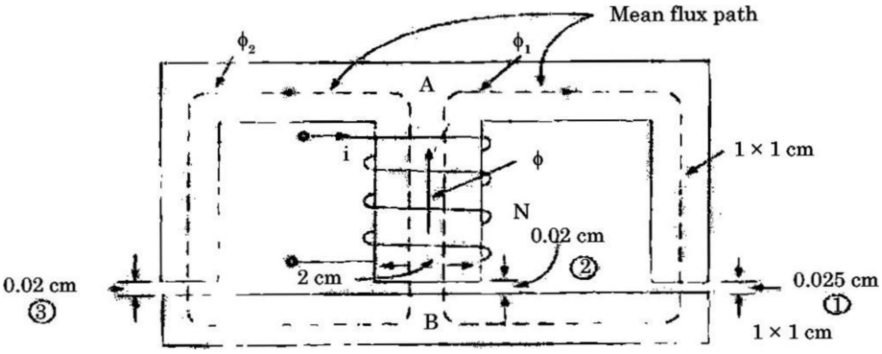
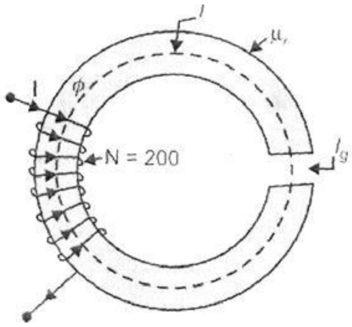


Figure 1. Magnetic circuit

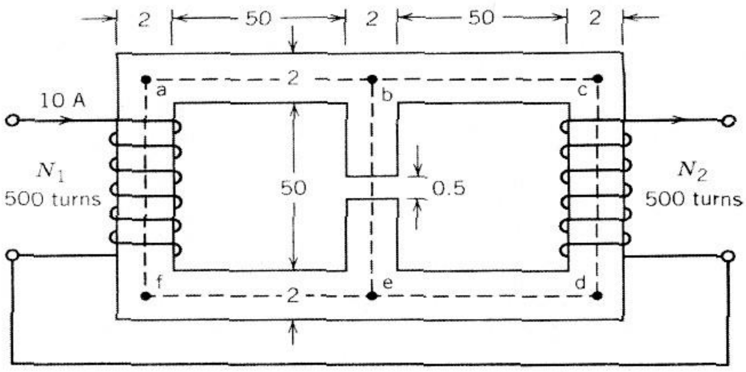
Mean length from A to B through either outer limb = 0.5 m Mean length from A to B through the central limb = 0.2 m

In the magnetic circuit shown it is required to establish a flux of 0.75 mWb in the air-gap of the central limb. Determine the mmf of the exciting coil if for the core material (a) μr = infinite (b) μr = 5000. Neglect fringing. **NOV/DEC 2020**

22. For the magnetic circuit shown in Figure 11 (a), estimate the number of ampere-turns necessary to produce a flux of 100000 lines round an iron ring of 6 cm2 cross section and 20 cm mean diameter having an air gap 2 mm wide across it. Permeability of the iron may be taken 1200. Neglect the leakage flux outside the 2 mm air gap. **NOV/DEC 2021**



23. In the magnetic circuit of Figure 11 (b), the relative permeability of the ferromagnetic material is 1200. Neglect magnetic leakage and fringing. All dimensions are incentimeters, and the magnetic material has a square cross-sectional area. Determine the air gap flux, theair gap flux density, and the magnetic field intensity in the air gap. **NOV/DEC 2021**



24. Derive an expression for energy and co-energy of a single excited system **NOV/DEC 2021**

25. Write technical notes on the following :

(i) Magnetic fields in rotating machines. (6)

(ii) Magnetic saturation and leakage fluxes. (7) **NOV/DEC 2021**

UNIT-2 DC GENERATORS

Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections-applications of DC Generators.

PART-A

1. Specify the role of Interpoles in DC machine? **NOV/DEC 2019 (APR/MAY 2023)**
2. What is meant by residual emf in DC generator?
3. Compare lap and wave winding. **NOV/DEC 2020**
4. State the number of parallel paths in a lap and wave connected armature winding.
5. State the various types of DC generators.
6. What is a magnetization characteristic?
7. Sketch the load characteristics of dc shunt generator, dc series generator and dc compound generator.
8. State the applications of various types of dc generators. Define commutation.
9. Name the methods of improving commutation. **NOV/DEC 2018 (NOV/DEC 2023)**
10. Define armature reaction. **ARP/MAY 2017, NOV/DEC 2021**
11. What are the effects of armature reaction?
12. Define critical field resistance in dc shunt generator. **N/D 2017 , NOV/DEC 2020**
13. What is the necessity for the parallel operation of dc machine? **(NOV/DEC 2023)**
14. State the condition under which DC shunt generator fails to excite. **ARP/MAY 2017**
15. What is the purpose of yoke in a DC machine? **NOV/DEC 2017**
16. Why the armature core in a DC machine is constructed with laminated steel sheets instead of solid steel sheets. **ARP/MAY 2018**
17. Draw and explain the magnetizing characteristics of DC shunt generator. **ARP/MAY 2018(APR/MAY 2023)**
18. Why load voltage across DC shunt generator is decreasing with increase in load current. **NOV/DEC 2018**
19. On what occasions DC generator may not have residual flux? **ARP/MAY 2019**
20. How the critical field resistance of a DC shunt generator is estimated from its OCC? **ARP/MAY 2019**
21. Write the advantages of wave winding in comparison with lap winding. **N/DEC 2021**

PART-B

1. Describe with neat sketches the construction and working of a DC machine.

2. Derive the EMF equation of DC generator. **(APR/MAY 2023)**
3. A 4-pole, lap connected DC machine has 540 armature conductors. If the flux per pole is .03Wb and runs at 1500 RPM, determine the emf generated. If this machine is driven as a shunt generator with same field flux and speed, calculate the line current if the terminal voltage is 400V.Given the RSH=450Ω and RA=2 Ω **(APR/MAY 2023)**

5. A 4 pole DC shunt generator with lap connected armature supplies 5 Kilowatt at 230 Volts. The armature and field copper losses are 360 Watts and 200 Watts respectively. Calculate the armature current and generated EMF?

6. Explain the effect of armature reaction in a DC shunt generator. How are its demagnetizing and cross-magnetizing ampere turns calculated? **ARP/MAY 2017 (APR/MAY 2023)**

7. Explain the process of commutation in a DC machine. and list out the various methods of improving commutation in detail with a neat sketch. **NOV/DEC 2017 (APR/MAY 2023)**

8. Explain the various methods of commutation. **(NOV/DEC 2023)**

9. A 12 pole D.C. generator has a simplex wave wound armature containing l44 coils of 10 turns each. The resistance of each turn is 0.011Φ. Its flux per pole is 0.05 Wb and it is running at a speed of 200 rpm. Obtain the induced armature voltage and the effective armature resistance.

10. A four pole lap wound shunt generator supplies 60 lamps of 100W, 240V each; the field andarmature resistances are 55 ohm and 0.18 ohm respectively. If brush drop is 1V for each brush find (i) Armature current (ii) current per path (iii) generated emf (iv)power output pf DC machine. **ARP/MAY 2017**

11. A separately excited generator when running at 1000 rpm suppies 200A at 1125V. What will be the load current when the speed drops to 800 rpm if field current is unchanged? Given that armature resistance = 0.04 ohm and brush drop = 2V. derive the necessary equation. **NOV/DEC 2017**

12. Two 500V DC shunt generators rated at 100kW and 200kW respectively are operating in parallel. Both of them have linearly drooping external characteristics. Voltage regulation ofthe first generator is 4% and that of the second generator is 6%. Determine the common busvoltage and current shared by each of the generators when they are in parallel to supply a current of 300A. **ARP/MAY 2018 (APR/MAY 2023)**

13. A 4 pole DC shunt generator with a shunt field resistance of 100 ohms and an armature resistance of 1 ohm has 378 wave connected conductors in its armature. The flux per pole is 0.02wb. if a load resistance of 10 ohm is connected across the armature terminals and the generator is driven at 1000 rpm. Calculate power absorbed by the load.**NOV/DEC 2018(NOV/DEC-2023)**

14. A separately excited DC generator when running at 1200 rpm supplies 200A at 125V to a circuit of constant resistance. What will be the circuit when the speed is dropped to 1000 rpm and the field current is reduced to 80%. Armature =0.4 ohm and total drop at brushes =2V. ignore saturation and armature reaction.**NOV/DEC 2018**

15. A 220V DC shunt machine has an armature resistance of 0.5 ohm and field resistance of 200 ohm. The machine is running at 1000 rpm as a motor drawing 31A from the supply mains. Calculate the speed at which the machine must be driven to achieve this as a generator**. ARP/MAY 2019**

16. Derive the relation for induced emf in the DC generator from the fundamental principle. **ARP/MAY 2019**

17. Explain the open circuit and load characteristics of shunt generator **NOV/DEC 2020 (NOV/DEC 2023)**

18. What is armature reaction? Describe the effects of armature reaction on the operation of DC machines. **NOV/DEC 2020**

19. A DC machine running at 750 rpm has an induced emf of 200 V.Calculate the speed at which the induced emf will be 250 V The percentage increase in main field flux for an induced emfof 250 V at a speed of 700 rpm. **NOV/DEC 2021**

20. Explain the open circuit and load characteristics of Series generator **(NOV/DEC 2023)**

21. A four-pole lap-wound DC machine has an armature of 20 cm diameter and runs at 1500 rpm. If the armature current is 120 A, thickness of the brush is 10 mm and the self-inductanceof each coil is 0.15 mH. determine the average emf induced in each coil during commutation.**NOV/DEC 2021**

UNIT-3 DC MOTORS

Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DCmotors, losses and efficiency in DC machine, condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test, Field test, Retardation test, Separation of core losses-applications of DC motors.

PART-A

1. What is back emf in dc motor? State its expression. **NOV/DEC 2019 (NOV/DEC 2023)**
2. State the various types of dc motors.
3. Draw the mechanical characteristics of all types of dc motor.
4. What is the necessity of starter for a dc motor? **ARP/MAY 2017 NOV/DEC 2019 (APR/MAY 2023)**
5. State the function of overload release in dc motor starters.
6. Why dc series motor is never started on no load? **NOV/DEC 2018**
7. How to change the direction of rotation of dc motor? **A/M 2018 A/M 2019**
8. State the various losses in dc machine.
9. Define Plugging
10. State the conditions of maximum efficiency in DC Machine? **(NOV/DEC 2023)**
11. Draw the power flow diagram for a dc generator and dc motor.
12. Name the various methods of testing dc machine.
13. What is the necessity for the parallel operation of dc machine?
14. What are the advantages of PMDC motors compare to conventional DC motors?
15. What are the applications of DC motors **ARP/MAY 2017**
16. What will happen to the speed of a DC motor if the flux approaches to zero? **NOV/DEC2017**
17. Mention the effects of differential compounding and cumulatively compound on the performance of DC compound motor. **NOV/DEC 2017**
18. Why commutator is employed in DC machines. **ARP/MAY 2018**
19. Which method is preferred for controlling the speed of DC shunt motor above the ratedspeed? Justify **NOV/DEC 2018**
20. Enumerate the factors on which the speed of a DC motor depends. **ARP/MAY 2019**
21. What are the applications of DC shunt and DC series motors? **N/DEC 2020**
22. The armature resistance of a DC shunt motor is 0.5 ohm, it draws 20 A from 220 V mainsand is running at a speed of 80 radian per second. Determine (i) Induced emf (ii) Electromagnetic torque. **NOV/DEC 2021**
23. Explain why Swinburne's test cannot be performed on DC series motor. **NOV/DEC 2020,N/DEC 2021(APR/MAY 2023)**

PART-B

1. Specify the techniques used to control the speed of DC shunt motor for below and above the rated speed?
2. Derive torque equation of DC motor? **(NOV/DEC 2023)**
3. Explain field controlled DC Series Motor? **(NOV/DEC 2023)**
4. Discuss in detail about shunt armature speed control of DC shunt motor.
5. What are the various starting methods of DC motor? Explain any one method. **(APR/MAY 2023)**
6. What are the methods of speed control of a DC shunt motor? And briefly explain them withthe help of neat diagram.
7. A 500V DC shunt motor running at 700 rpm takes an armature current of 50A. Its effectivearmature resistance is 0.4Ω. What resistance must be placed in series with the armature to reduce the speed to 600 rpm, the torque remaining constant? **(APR/MAY 2023)**
8. A 230 volt DC shunt motor on no-load runs at a speed of 1200 RPM and draws a current of 4.5 Amperes. The armature and shunt field resistances are 0.3 ohm and 230 ohms respectively. Calculate the back EMF induced and speed, when loaded and drawing a current of 36 Amperes.
13. With the help of neat circuit diagram, explain swinburne's test and derive the relations for efficiency (both for generator and motor) also state the merits and demerits of this method
14. With the help of neat circuit diagram, explain Hopkinson's test and state the merits anddemerits of this method. **(NOV/DEC 2023)**
15. Explain the Ward – Leonard system of controlling the speed of a DC shunt motor with thehelp of neat diagram.
16. With the help of neat circuit diagram, explain Swinburne's test and derive the relations for efficiency (both motor and generator). **ARP/MAY 2017**
17. Draw the neat sketch of 3 point starter and explain its working. **NOV/DEC 2017**
18. A 400V DC shunt motor takes 4A at no load. Its armature and field resistance are 0.4 ohmsand 220 ohms respectively. Estimate the kW output and efficiency when the motor takes 60A on full load. **ARP/MAY 2018**
19. Determine developed torque and shaft torque of 220V, $ pole series motor with 800 conductors wave connected supplying a load of 8.2kW by taking 45A from the mains. The flux per pole is 25m/Wb and its armature circuit resistance is 0.6 ohm. **ARP/MAY 2018**
    (APR/MAY 2023)
20. A 220V, 22A,1000 rpm DC shunt motor has armature circuit resistance of 0.1 ohm and field resistance of 100 ohm. Calculate the value of additional resistance to be inserted in the armature circuit in order to reduce the speed to 800 rpm. Assume the load torque to be i) proportional to speed and ii) proportional to the square of the speed. **ARP/MAY 2018(PART-C)**

21. A 230V DC shunt motor has an armature circuit resistance of 0.4 ohm and field resistance of 115ohm. The motor drives a constant a constant torque load and takes an armature current of 20A at 800rpm. If motor speed is to be raised from 800 to 1000 rpm, find the resistance that must be inserted in the shunt field circuit. **NOV/DEC 2018**

22. Explain the various characteristics of DC compound motor with necessary graphs. **NOV/DEC 2018**

23. A 220V shunt motor has armature and field resistance of 0.2 ohm and 220 ohm respectively. The motor is driving load torque proportional to n^2 and running at 1000 rpm drawing 10A current from the supply. Calculate the new speed and armature current if an external resistance of value 5 ohm is inserted in the armature circuit. Neglect armature reaction andsaturation. **ARP/MAY 2019**

24. A 220V DC series motor has armature and field resistance of 0.15 ohm and 0.10 ohm respectively. It takes a current of 30A from the supply while running at 1000 rpm, if a diverter resistance of 0.2 ohm is connected across the field coil of the motor, calculate the new steady state armature current and the speed. Assume the load torque remains constant.**ARP/MAY 2019**

25. A4 pole, 250 V, wave connected shunt motor gives 10 kW when running at 1000 rpm and drawing armature and field currents of 60 Aand 1 Arespectively. It has 560 conductors and armature resistance of 0.2 Ohms. Assuming a drop of 1 Vper brush, determine total torque, useful torque, useful flux per pole, rotational losses and efficiency. **NOV/DEC 2020**

26. Explain the different methods of speed control techniques of DC motors. **ARP/MAY 2017,NOV/DEC 2017, NOV/DEC 2020**

27. Adc shunt generator delivers 50 kW at 250 Vwhen running at 400 rpm. The armature and field resistance are 0.02 Ω and 50 Ω respectively. Calculate the speed of the machine whenrunning as a shunt motor and taking 50 kW input at 250 V. Allow 1 Vper brush for contact drop. **NOV/DEC 2020**

28. A 230 V, 1000 rpm DC shunt motor has field resistance of 115 Ω and armature circuit resistance of 0.5ohm . At no-load, the motor runs at 1000 rpm with armature current of 4A and with full field flux. Find the speed of the motor and armature current for the developed torque of 80 Nm. Also determine the value of external resistance that must be inserted in series with the field winding to make the motor to develop power of 8 kW at 1250 rpm. **NOV/DEC 2021**

29. Hopkinson's test on two shunt machines gave the following full load results: Line voltage = 220 V, Line current excluding field currents = 12 A. Motor armature current 72 A, Field currents = 1.5 A and 1 A. Armature resistance of each machine is 0.2ohm. Calculate the efficiency of each machine. **NOV/DEC 2021**

30. A 210 V dc shunt motor develops 18 kW when taking 21 kW. Field and armature resistance values are 60Ω and 0.05Ω respectively. What is the efficiency and power input when the output is 8 kW. **NOV/DEC 2021**

UNIT-4 SINGLE PHASE TRANSFORMERS

Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-toback test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.

PART-A

1. Differentiate between a core and shell type transformer. **NOV/DEC 2017**
2. Mention the conditions to be satisfied for parallel operation of two winding transformers. **ARP/MAY 2018** (APR/**MAY 2023)**
3. Give the principle of transformers.
4. Why is transformer rated in KVA? **ARP/MAY 2017**
5. Which equivalent circuit parameters can be determined from the open circuit test on a transformer? **(APR/MAY 2023)**
6. The emf per turn for a single phase 2200/220V, 50Hz transformer is 11V. Calculate thenumber of primary and secondary turns.
7. What is the purpose of laminating the core in a transformer?
8. Define all day efficiency of a transformer. **NOV/DEC 2019 (NOV/DEC 2023)**
9. What are different losses occurring in a transformer?
10. Write the material used for transformer core construction.
11. Why the wattmeter in OC test of transformer reads core loss and that in SC test reads copperloss at full load. **ARP/MAY 2017**
12. How do you reduce leakage flux in a transformer? **NOV/DEC 2017**
13. Full load copper loss in a transformer is 1600W, what will be the loss at half laod? **ARP/MAY 2018**
14. What is the condition for maximum efficiency of transformer? **NOV/DEC 2018**
15. Define voltage regulation. **NOV/DEC 2018**
16. If a transformer has 50 turns in the primary winding and 10 turns in the secondary winding,what is the reflective resistance if the secondary load resistance is 250 ohm? **A/M 2019**
17. A certain transformer has a turn's ratio of 1 and a coupling coefficient of 0.85, when 2V acis applied to the primary, what is the secondary voltage? **ARP/MAY 2019**

18. The full load copper loss in a transformer is 600W and iron loss is 400W. what will be thecopper loss and iron loss at half load? **NOV/DEC 2019**

19. What are the uses of parallel operation of transformers? **N/D 2020,NOV/DEC 2021, (NOV/DEC 2023)**

20. Mention the condition for obtaining maximum efficiency in transformers. **N/D 2020**

21. What are the properties of an ideal transformer? **NOV/DEC 2021**

PART-B

1. A 75 KVA single phase transformer has 500 turns primary and 100 turns secondary. The primary and secondary windings resistances are 0.4 and 0.02 ohm respectively and the corresponding leakage reactances are 1.5 and 0.045 ohm respectively. The supply voltage is2200V. Calculate

a) the equivalent impedance referred to the primary circuit and

b) the voltage regulation

c) secondary terminal voltage for full load at power factor of

i) 0.8 lagging ii) 0.8 leading **NOV/DEC 2017(PART-C) (APR/MAY 2023)**

2. Describe the method of calculating the regulation and efficiency of a single phasetransformer by OC and SC tests.? **(NOV/DEC 2023)**

3. Discuss the Sumpner's Test of Transformer. Why it is needed? What are its advantages? **(NOV/DEC 2023)**

4. The following data were obtained on a 20 KVA, 50 Hz, 1100/220 V distribution transformer:

	Voltage (V)	Current (A)	Power (W)
OC test with LV open circuited	1100	0.5	55
SC test with HV short circuited	10	80	400

Draw the approximate equivalent circuit of the transformer and calculate voltage regulation and efficiency for the above transformer ehen supplying 100A at 0.8 pf lagging. **ARP/MAY2017**

5. Explain the principle and operation of transformer. Derive its EMF equation. **NOV/DEC 2017**

6. Draw and explain the phasor diagram of transformer when it is operating under load**. NOV/DEC 2017**

7. The emf per turn of a single phase 6.6kv/440V, 50 Hz transformer is approximately 10V. Calculate the number of turns in the HV and LV windings and the net cross sectional area of the core for a maximum flux density of 1.6T. **ARP/MAY 2018**

8. A 11000/230 V, 150kVA , single phase 50Hz transformer has a core loss of 1.4 KW at full load copper loss of 1.6 kW. Determine

i. The KVA load for maximum efficiency and the value of maximum efficiency an unity p.f

ii. The efficiency at 0.8 pf leading. **ARP/MAY 2018 (APR/MAY 2023)**

9. A 20 kVA, 2000/200Hz single phase transformer has the following parameters: r1=2.8 ohm r2=0.02 ohm x11=4.2 ohm and x12=0.6 ohmCalculate:

1) Equivalent resistance, leakage reactance and impedance referred to HV side.
2) Equivalent resistance, leakage reactance and impedance referred to LV side.
3) Full load copper loss. **ARP/MAY 2018(PART-C)**

10. A single phase transformer has Z1=1.4+j5.2 ohm and Z2=0.0117+j0.0465 ohm. The input voltage is 6600V and the turn's ratio is 10.6: 1. The secondary feeds a load which draws 300A at 0.8 power factor lagging. Find the secondary terminal voltage and the kW output. Neglect no-load current. **NOV/DEC 2018**

11. Draw neat diagram of back to back test method. Also write the formulas to calculate the power and efficiency. **NOV/DEC 2019**

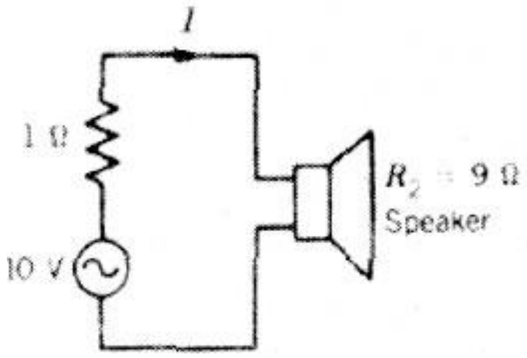
12. Draw and explain the phasor diagram of a transformer under leading, lagging and unity power factor. Phasor diagram should indicate primary and secondary parameters. **NOV/DEC 2020**

13. A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full load of 500 W. Determine the efficiency at 75% full load and the maximum efficiency. **NOV/DEC 2020**

14. Two transformers of 20 kVA each with turn-ratios respectively of 250 1000 and 250: 1025 are connected in back-to-back test; the two primaries being fed from a 250 V supply and secondaries being connected in phase opposition. A booster transformer connected on primary side to the same 250 V supply is used to inject voltage in the circuit of secondariessuch as to circulate a current of 20 A. The core losses of each transformer are 350 W and each transformer has a reactance of 2.5 times its resistance. Calculate the possible readings of the wattmeter connected to measure the input to the primaries(5) **NOV/DEC 2021**

15. Two single-phase transformers connected in parallel supply a load of 1000 A at 0.8 p.f. lagging. For each transformer, the secondary emf on open circuit is 3300 V and the total leakage impedances in terms of the Secondary are (0.1 + j0.2) and (0.05 +j0.4) ohm, respectively. Determine the output current for each transformer and the ratio of the kW output of the two transformers. **NOV/DEC 2021.**

16. A speaker of 9Ω, resistive impedance is connected to a supply of 10 V with internal resistive impedance of 1Ω, as shown in Figure.4. Determine the power absorbed by the speaker. To maximize the power transfer to the speaker, a transformer of 1 : 3 turns ratio is used betweensource and speaker as shown in Figure 12 (a). Determine the power taken by the speaker. **NOV/DEC 2021.**



17. The efficiency of a 250 kVA, single phase transformer is 96% when delivering full load at 0.8 power factor lagging and 97.2% when delivering half full-load at unity power factor.Determine the efficiency at 75% of full load at 0.8 power factor lagging. **NOV/DEC 2021.**

UNIT-5 AUTO TRANSFORMER AND THREE PHASE TRANSFORMER

Construction and working of auto transformer, comparison with two winding transformers,applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.

PART-A

1. Specify the applications of autotransformer?
2. Mention the role of tertiary winding in transformer.
3. What is the basic purpose of tertiary winding?
4. Compare two winding transformer and auto transformer. **(APR/MAY 2023)**
5. Name the various configuration in three phase transformer.
6. What is meant by scott connection.
7. Mention some of the applications of scott connection transformer.
8. Write the EMF equation of three phase transformer.
9. What is the need of scott connection transformer.
10. Explain about star connection in three phase trasformer**(APR/MAY 2023)**
11. Expain about delta connection in three phase trasnformer**(NOV/DEC 2023)**
12. Draw the addition and subtraction polarity of auto-transformer with the help of two winding transformer. **(NOV/DEC 2023)**

PART-B

1. Prove that amount of copper saved in auto transformer is (1 – K) times that of ordinary transformer.
2. Explain the construction and working of auto transformer.State its application **(APR/MAY 2023) (NOV/DEC 2023)**

3. Explain in detail about three phase transformer construction, connection types and theirfeatures in detail.
4. Explain the construction and working of scott connection transformer. **(NOV/DEC 2023)**
5. Compare two winding transformer with auto transformer.
6. Explain in detail about application of auto transformer and scott connection transformer. **(APR/MAY 2023)**
7. Explain in detail about star and delta connected windings in a three phase transformer.
8. Describe briefly about star and delta connected three phase transformer in detail.

9.A three phase transformer bank consisting of three single phase transformers is used to step down the voltage of a three phase, 6600 V transmission line. If the primary line currentis 10 A, Calculate the secondary line voltage, line current and output KVA for the following connections: (a) Y /Δ ; (b)Δ/Y. The turn's ratio is 12. Neglect losses.