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**QUESTION BANK (Descriptive)**

**Subject with Code :** Electrical Machines-I **(**18EE0204**)** **Regulation:** R18

**Course & Branch**: B.Tech– EEE **Year & Sem:** II-B.Tech & I-Sem

## UNIT – I
## D.C GENERATORS

1. Explain the basic principle of operation of a DC Generator with a simple loop generator? [L2] 10M
2.(a) How demagnetizing and cross magnetizing ampere turns per pole are calculated in a DC Machine? [L2] 5M

   (b) The brushes of a certain lap connected 400kw, 6-pole generator are given a lead of $18^o$ electrical. From the data given, calculate (i) the demagnetizing ampere-turns (ii) the cross-magnetizing ampere-turns (iii) series turns required to balance the demagnetizing component. The full load current is 750A and total number of conductors are 900 and the leakage coefficient is 1.4. [L4] 5M

3. (a) Deduce an expression for e.m.f equation of DC Generator? [L4] 5M

   (b) An 8-pole lap connected armature has 960 conductors, a flux of 40 m Wb per pole and a speed of 400 r.p.m. Calculate the emf generated on open circuit. If the armature were wave connected, at what speed it must be driven to generate 400 V. [L4]5M

4. A DC Compound Generator has 110V as terminal voltage. The armature resistance, shunt field Resistance and series field resistance are 0.06Ω, 25Ω and 0.04Ω respectively. The load consists of 200 lamps each rated at 55W. Find the total emf generated and armature current when the machine is connected as (i) Long Shunt (ii) Short Shunt. [L4] 10 M

5. (a)What are the causes for the failure of self excitation [L2] 5M

   (b) Distinguish between Lap and Wave windings? [L2] 5M

6. (a) What are the various characteristics of compound generators? [L1] 5M

   (b).Derive the expression for reactance voltage? [L2] 5M

7. Enumerate all the parts of a DC machine and indicate their function? [L1] 10M
8. Explain the effects of armature reaction in a DC Generator Briefly? [L2] 10M
9. Draw and explain the characteristics of DC series and DC Shunt Generators. [L2] 10 M
10. A d.c. shunt generator has the following open circuit magnetization curve at its rated speed.

| Field current(A) | 0.5 | 1.0 | 1.5 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| E.M.F(V) | 180 | 340 | 450 | 500 | 550 | 570 |

The resistance of the field circuit is 200 ohms. The generator is driven at its rated speed. Find the terminal voltage on open circuit.(Use graph paper) [L4] 10 M

11. a) What is the purpose of yoke? [L1] 2M
    b) Write the purpose of the commutator? [L1] 2M
    c) What is meant by armature reaction? [L1] 2M
    d)What is the purpose of inter poles? [L1] 2M
    e) What is the purpose of pole shoe? [L1] 2M
    f) Define commutation [L1] 2M
    g) What are the basic things required for a generating action? [L1] 2M
    h) Define critical speed and Critical Field resistance [L1] 2M
    i) Define pole pitch and front pitch [L1] 2M
    j) What are the effects of Armature reaction? [L1] 2M

## UNIT –II

## D.C MOTORS

1. A 25HP, 250V DC Series motor has armature resistance 0.1Ω and field resistance 0.05Ω and brush Contact drop 3V. When the line current is 80A, the speed is 600rpm. Find the speed when the line Current is 100A. [L4]10 M

2. (a) Draw and explain the characteristics of DC series Motors. [L2] 5 M
   (b) Draw and explain the characteristics of DC Shunt Motors. [L2] 5 M

3. Explain the principle of operation of a D.C motor . Derive the equation for the torque Developed by a D.C. motor. [L2] 10M

4. (a) Write the power equation of a D.C motor and derive the condition for maximum power. [L4]5M
   (b) Find the torque exerted by a 4-pole series motor whose armature has 1200 conductors Connected up in wave winding. The motor current is 10A and the flux per pole is 0.02Wb. [L4] 5M

5. Explain in detail about the types of D.C motors. Also mention their applications? [L1]10M

6. Explain the operation of four point starter for a DC motor with neat diagram? [L2]10M

7. Explain the armature voltage and field flux control methods for the Speed control of a DC Motor. [L2]10M

8. Why is a starter necessary for a DC motor? Explain the working of a three-point starter with the help of a neat diagram? [L1]10M

9. (a) Enumerate the losses in DC machine. [L1]5M
   (b) Derive the condition for maximum efficiency. [L1]5M

10. A shunt generator has a full load current of 195A at 250V. The stray losses are 720W & shunt field coil resistance is 50 ohms. It has a full load efficiency of 90%.Find armature resistance. Also find the current corresponding to maximum efficiency. [L4]10M
11. (a) Define torque ? [L1]2M
    (b) If the applied voltage of a DC motor is 230 V, then back emf, for maximum power developed is? [L4]2M
    (c) What is the emf generated by a 4 pole lap connected DC motor rotating at 1500 rpm having 200 conductors and useful flux per pole is 0.4 mwb. [L4]2M
    (d) The speed of a motor falls from 1100 r.p.m at no-load to 1050 r.p.m at rated load. The speed regulation of motor is. [L3]2M
    (e) State Fleming's Left hand rule . [L1] 2M
    (f) Write the condition for maximum efficiency? [L1]2M
    (g) Which losses are called variable losses? [L1]2M
    (h) Which losses are called constant losses? [L1]2M
    (i) Define efficiency and write the equation for efficiency? [L1]2M
    (j)State advantages of flux control methods of D.C shunt motor. [L3]2M

## UNIT –III
## PARALLEL OPERATION OF DC GENERATORS
## TESTING OF DC MACHINES

1. Explain in detail about the parallel operation of DC shunt generators [L2]10M

2. Explain Swinburne's test on DC machines? What are its advantages and disadvantages? [L2] 10M

3. Explain the procedure for obtaining the efficiency by using brake test on DC shunt machine. [L2] 10M

4. Describe Hopkinson test in detail. What are its advantages and disadvantages? [L2] 10M

5. Two shunt wound d.c generators are connected in parallel to supply a load of 500A. Each machine has an armature resistance of 0.03Ω and field resistance of 60Ω but the emf of one machine is 600v and that of other is 640V. What power does each machine supply? [L4] 10M

6. Describe Field's test in detail. What are its advantages and disadvantages? [L2]10M

7. Describe Retardation test in detail. What are its advantages and disadvantages ? [L2] 10M

8. Explain in detail about the parallel operation of DC series generators [L2]10M

9. In a Brake test conducted on a dc shunt motor the full load readings are observed as,
   Tension on tight side = 9.1kg
   Tension on slack side = 0.8 kg
   Total current = 10A
   Supply voltage=110V
   Speed = 1320 r.p.m
   The radius of the pulley is 7.5cm. Calculate its full load efficiency.
10. The following results were obtained during Hopkinson's test on two similar 230V machines, armature currents 37A and 30A; Field currents 0.85A and 0.8A. Calculate the efficiencies of machines if each has armature resistance of 0.33Ω.
11. (a)Why Swinburne's test is called no load test? [L1] 2M
    (b) Name the methods of direct and indirect testing? [L1]2M
    (c) Draw the power flow diagram of D.C motor. [L1] 2M
    (d) Name the various methods of testing a d.c machine. [L1] 2M
    (e) Which losses are involved while conducting no load test? [L1] 2M
    (f) What are the limitations of Hopkinson's test? [L1] 2M
    (g) Define efficiency [L1] 2M
    (h) What are the Iron losses write the equations? [L1] 2M
    (i) What is the necessity of operating generators in parallel? [L1] 2M
    (j) Define kinetic energy and write the formula [L1] 2M

## UNIT –IV

## SINGLE PHASE TRANSFORMERS

1) a) With relevant phasor diagrams, explain the operation of a practical single phase transformer under no load condition. [L2] [6M]

b) A 230/2300V transformer takes a no load current of 6.5A and absorbs 187W. If the resistance of primary is 0.06Ω, find (a) Core loss (b) no load power factor (c) active component of current and (d) magnetizing current. [L3] [4M]

2. Discuss the constructional features of transformers. Draw neat diagram. [L2] [10M]

3. a) In a transformer, derive the condition for maximum efficiency and thus find the load current at which the efficiency is maximum. [L3] [4M]

b) A 20KVA,2000/200V single phase transformer has the following parameters H.V winding: R1=3Ω , X1=5.3Ω, L.V winding: R2=0.05 Ω ,X2=0.1 Ω. Find the Voltage Regulation at (i) p.f of 0.8 lagging (ii) UPF (iii) 0.707 p.f leading [L3] [5M]

4. a) Explain the principle of operation of a transformer. [L2] [5M]

(b) Compare core type and shell type transformer [L2] [5M]

5. a) Explain the effect of variations of frequency and supply voltage on iron losses. [L2] [4M]

b) A 10KVA, 2200/400V transformer has R1=5 Ω, X1=12 Ω, R2=0.2 Ω and X2=0.48 Ω. Determine The equivalent impedance of the transformer referred to (i) primary side (ii) secondary side. [L3] [6M]

6 (a)What are the various losses taking place in transformer? How these losses can be minimized? [L2] [5M]

(b) The efficiency of a 200KVA , single phase transformer is 98.7% when operating at full-load,0.8 power factor lagging, the iron loss in the transformer is 200W. calculate (i) full load copper loss (ii) Half load copper loss

[L3] [5M]

7. (a) Draw the Expression for Voltage regulation of a transformer form the simplified approximate equivalent circuits of 1-Φ transformer and also obtain condition for zero regulaton. [L3] [6M]

(b) A 10KVA, 2000/400V single phase transformer has the following data: $R_1$=5Ω, $X_1$=12Ω, $R_2$=0.2 Ω, $X_2$=0.48 Ω. Determine the secondary terminal voltage at full load, 0.8 power factor lagging when the Primary supply voltage is 2000V. [L3] [6M]

8. (a) What is an ideal transformer? Also explain the operation of an ideal single phase transformer under no load condition. [L2][5M]

(b) An ideal 25KVA transformer has 500 turns on the primary winding and 40 turns on the secondary winding. The primary is connected to 3000V, 50HZ supply. Calculate (i) primary and secondary currents at full load (ii) secondary emf and (iii) the maximum core flux. [L3] [5M]

9. (a) Derive an expression for saving of copper when an auto transformer is used? [L2] [6M]
b) Explain about of an Auto transformer. [L2] [5M]

10.(a) Derive the e. m. f. equation of a transformer. [L3] [5M]
(b) A single phase 50Hz transformer has 100 turns on the primary and 400 turns on the secondary winding. The net cross sectional area of core is 250 $cm^2$. If the primary winding is connected to a 230V , 50Hz determine (i) EMF induced in the secondary winding(ii) The maximum value of flux density in the core [L4][5M]

11.a) Define a transformer? [L1] [2M]
b) Write the Emf equation of a transformer and define each term [L1] [2M]
c) Formulate the Regulation of a transformer at any load . [L1] [2M]
d) A 1100/400 V, 50 Hz single phase transformer has 100 turns on the secondary Winding. Calculate the number of turns on its primary, transformation ratio and turns ratio. [L1] [2M]
e) Full load copper loss in a transformer is 1600 watts. What will be the copper loss at half full load and 3/4$^{th}$ full load? [L1] [2M]
f) Why is the rating of the transformer expressed in KVA? [L1] [2M]
g) What would be happen if a transformer is connected to DC supply? [L1] [2M]

h) Give any two comparisons of two winding transformer with auto transformer. [L1] [2M]
i) What are the different types of transformer based up on their construction? [L1] [2M]
j) Define transformation ratio and write the relation [L1] [2M]

## UNIT –V
## TESTING OF TRANSFORMERS
## SINGLE PHASE INDUCTION MOTORS
## STARTING METHODS

1. Discuss how you will perform O.C and S.C tests on a single phase transformer in the Laboratory. [L2][10M]
2. A 2 kVA, 115/230 V, 50HZ transformer gave the following test results:

   Short-circuit test: 13 V, 8.7 A, 100 W

   Open circuit test : 115 V, 1.1 A, 50 W

   Determine (i) the transformer equivalent circuit referred to primary and insert all the values in it.

   (ii) Calculate the voltage regulation and efficiency at full load at 0.8 power factor lagging.

   (iii) Maximum efficiency at 0.8 power factor lagging [L3] [10M]

3. Explain about principle of operation of single phase induction motor. [L2][10M]
4. A 600W,230V,50Hz, 6 pole,1-Ø Induction Motor has following parameters. Resistance of main stator winding =3Ω,Reactance of main stator winding =4.15Ω, Reactance of magnetizing branch referred to stator =107Ω, Rotor Resistance referred to stator at stand still =6.2Ω, Rotor Reactance referred to stator at stand still =2.2Ω . The core losses are 75W While mechanical losses are 25W, The motor is operating with 5% slip calculate i)input current ii) power factor iii) gross power iv) shaft power v) efficiency. [L3] [10M]
5. (a) Explain the double revolving field theory and draw the torque speed characteristics. [L2] [5M]
   (b) 1-Ø Induction Motor is 4 pole, Output= 410w,Supply voltage=230V,frequency =50Hz, input current =3.2A, power factor=0.7, Speed = 1410 rpm ,Calculate i)the efficiency and ii) the slip of the motor when delivering rated output. [L3] [5M]
6. Explain the operation of Split phase 1-Ø Induction Motor. [L2][10M]
7. Give the classification of single phase motors .Explain any two types of single phase induction motors. [L2][10M]

8. Explain the construction and operation of Universal Motor. List out its merits and demerits. [L2][10M]

9. Explain working principle of a Shaded Pole Motor With diagram. [L2][10M]
10. Explain the construction and working of stepper motor [L2][10M]

11.(a) What are the types of 1-Ø Induction Motor? [L1] [2M]
(b) Draw the speed-torque characteristics of Shaded –Pole Motor. [L1] [2M]
(c) What kind of motors used in ceiling fan and wet grinders? [L1] [2M]
(d) What are the types of Stepper Motors? [L1] [2M]
(e) Why single phase induction motor is not a self starting one?. [L1] [2M]
(f) List out 4 applications of shaded pole induction motor? [L1] [2M]
(g) What is the function of capacitor in single phase induction motor? [L1] [2M]
(h) State any 4 use of single phase induction [L1] [2M]
(i) Why O.C test conducted always on a L.V side of a transformer? [L1] [2M]
(j) why S.C test conducted always on H.V side of a transformer? [L1] [2M]