B.E. / B.Tech. DEGREE II SEMESTER

Sub Code :EC 2201 **Subject Name: Electrical Engineering**

University Question bank

Unit 1

Part A

1.A.1 In every DC motor, a generator action occurs. Justify.***(nov/dec 2007)***

yes , every DC motor will act as a DC generator. Which is depend on input energy

1.A.2 Why a DC series motor should not be started on no load?***(nov/dec 2007)***

it has high speed at time of starting, it will affect motor parts. So DC series motor should start with load

1.A.3 What are the conditions to be fulfilled for the self-excitation of a dc shuntgenerator?(may 10)

Even after the field current is reduced to zero, the machine is left out with some flux as residue so emf is available due to residual flux. This is the condition for self-excitation of a dc shuntgenerator.

The generator should have residual flux, the field winding should be connected in such a manner that the flux setup by field in same direction as residual flux, the field resistance should be less than critical field resistance, load circuit resistance should be above critical resistance.

1.A.4 What are the functionS of interpoles and how are the nterpoleswindingsconnected?(may 10)

Interpoles are provide to imporove commutation. Commutation poles have exciting coils which are connected in series with armature.

1.A.5 Write the speed equation of a dc machine.*(may 2007)*

N= (V-IaRa)/Φ so speed depends on air gap flux, resistance of armature, voltage applied to armature.

1.A.6 Name any two non-loading method of testing de machines. *(may 2007)*

A. swinburnes test, B.open circuit test C. speed control method

1.A.7 What are the functions of yoke in a D.C. machine?*(nov 2009)*

It is outer most cover of DC machine

It is used to avoid leakage of magnetic flux

1.A.8 List the methods of speed control of a D.C. shunt motor.*(nov 2009)*

Armature control method

Field control method

1.A.9 What is a dc compound generator? *(nov2010)*
Critical field resistance is defined as the resistance of the field circuit which will cause the shunt generator just to build up its emf at a specified field. It should have parallel field winding with armature winding

1.A.10 What is the need for starter in dc motor? What is a dc compound generator? *(nov2010), (nov 2011)*

At the time of starting, initial voltage is very small. Motor have high starting current. So starter will reduce starting high starting current to low current. This is the purpose of starter

1.A.11 What are the applications of step up and step down transformers *(nov 2011)*
To increase or decrease of voltage of transformer. Communication purpose

1.A.12 Distinguish between shunt and series field coil construction in DC machine? *(nov 2011)* Shunt field coils are wound with wires of small section and have more noof turns. Series field coils are wound with wires of larger cross section and have less noof turns.

Part B

1.A. 1 (a) (i) Draw the Speed-Torque characteristics of different types of DC motors.

(ii) Explain the different methods of speed control of DC motors. *(novdec 2007)* .

1.A.2 (b) (i) Explain the Swinburne's test to predetermine the efficiency of a DC machine. (ii) Obtain the expression for efficiency of the DC machine both as a motor and as a generator using the observations from the Swinburne's test. *(novdec 2007)* .

1.A. 3 (i)Describe with a neat sketch, the construction of a d.c. machine. .

(ii)A separately excited dc generator running at 1000 r.p.m. supplied110 A at 220 V to a resistive load. If the load resistance remainsconstant, what will the load current if the speed is reduced to800 r.p.m? Armature resistance is 0.02 Ω . Field current is unaltered. Assume a voltage drop of 1 V per brush. Ignore the effect of armature reaction.*(may 2010)*

1.A. 4 (i)Derive from the first principle, an expression for the torque developed in d.c. motor. .

(ii)In a brake test on a dc shunt motor, the load on one side of thebrake was 35 kg and on the other side 5 kg. The motor was runningat 1500 r.p.m. its input being 34 A at 400 V. The diameter of thepulley is 50 c.m. Determine the torque and efficiency of the motor. *(may 2010)*

1.A. 5. (i) Explain the principle of operation of DC motor. (8) .

(ii) Draw the schematic diagram of all types of DC machines. (8)*(may 2007)* .

1.A. 6 Explain the Swinburne's test of predetermination of efficiency of a DC Machine as generator and motor. (16) *(may 2007)* .

1.A. 7 (a) (i) With a neat sketch explain the constructional details of a D.C. machine. (ii) Draw and explain the internal and external characteristics of aD.C. shunt generator. *(nov2009)*

1.A.8 (i) Derive the torque equation of a D.C. motor. (6)

(ii) With a neat sketch explain the operation of a three point starter for a D.C. motor. (10) *(nov2009)* .

1.A. 9 (a) (i) Briefly explain the construction of a DC machine with neat diagram. (Marks

(ii) A dc shunt generator has a terminal voltage of 160 V and a no-load induced emf of 168 V. The resistances of armature and field are 0.03 and 20 . Find the armature current, field current and load current. Neglect armature reaction. *(nov 2010)* .

1.A. 10 (i) Explain the characteristics of series, shunt and compound motors.(9)

(ii) Explain the Ward Leonard method of speed control of dc shunt motor. (Marks 7)*(nov 2010)* .

1.A. 11 (a) (i) Sketch and explain the speed-current, speed-torque and torque-current characteristics of a DC shunt and series motor (8)

(ii) Derive the expression for emf generated in d.c. machine (8)

(nov 2011)

1.A. 11 (i) Explain in detail about the ward-leonardsistem of speed control of DC motor. (8) (ii) Draw a neat sketch and explain a 3 point starter. (8) *(nov 2011)*

Unit 2
Part A

2.A.1 List down the different types of losses in a Transformer.***(nov/dec 2007)***

Ans: *Core Loss b) Copper loss*

2.A.2What are the necessary tests to determine the equivalent circuit of a transformer?***(nov/dec 2007)***

Ans: *Open Circuit Test b)Short circuit Test*

2.A.3 The emf per turn of a single phase, 6.6 kV/440 V, 50 Hz Transformer is approximately 12V 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 1.5 T.(may 10)

Ans: Refer notes

2.A.4 Define voltage regulation of a transformer.(may 10)*& (nov2010)& (may 2007)*

Ans: When a transformer is loaded with a constant primary voltage, the secondary voltage decreases for lagging PF load, and increases for leading PF load because of its internal resistance and leakage reactance. The change in secondary terminal voltage from no load to full load expressed as a percentage of no load or full load voltage is termed as regulation.

% regulation down=(V2noload-V2F.L)*100/V2noload

% regulationup =(V2noload-V2F.L)*100/V2F.L

2.A.5 Write down the emf equations of a single phase transformer.*(nov 2009)*

Ans: Emf induced in primary coil E1= 4.44fΦmN1 volt
emf induced in secondary coil E2 =4.44 fΦmN2.
f-freq of AC input
Φm-maximum value of flux in the core
N1,N2-Number of primary & secondary turns.

2.A.6 Give the expression for percentage voltage regulation of a single phase transformer.*(nov 2009)*

Ans : % regulation down=(V2noload-V2F.L)*100/V2noload
% regulationup =(V2noload-V2F.L)*100/V2F.L

2.A.7 Why is the core of transformer laminated? *(nov2010)*

Ans : The eddy current loss is minimized by laminating the core,

2.A.8 Define regulation and efficiency of the transformer. *(nov 2011)*

Regulation: When a transformer is loaded with a constant primary voltage, the secondary voltage decreases for lagging PF load, and increases for leading PF load because of its internal resistance and leakage reactance. The change in secondary terminal voltage from no load to full load expressed as a percentage of no load or full load voltage is termed as regulation.

% regulation down=(V2noload-V2F.L)*100/V2noload

% regulationup =(V2noload-V2F.L)*100/V2F.L

Efficiency: The ratio between Output power & Input Power

% η = (O/P Power) / (I/P Power) * 100

Part B

2.B.1 (a) (i) Explain how 3 phase power can be measured using two watt meters method.
(ii) Obtain the expression for the total power and load power factor in terms of wattmeter Wi and W2. *(novdec 2007)*

2.B.2 (b) (i) Derive the condition for maximum efficiency of a transformer.
(ii) For a 40 KVA, single phase transformer, the iron losses and full load copper losses are 350 W and 400 W respectively. Find the efficiency at unity power factor on full load and determine the load for maximum efficiency. *(novdec 2007)*
2.B. 3 (i)From first principles, derive the emf equation of a transformer. Also show that the voltage induced per turn is the same, whether it isprimary or secondary.
ii)A single phase transformer with a ratio of 6.6. kV/415 V takes at no-load current of

0.75 A at 0.22 p.f. If the secondary supplies acurrent of 120 A at 0.8 p.f. calculate the total current taken by the primary. *(may 2010)*

2.B.4 iDevelop an equivalent circuit for a single phase two windingtransformer.Calculate the full-load efficiency at 0.8 p.f. and the voltage at thesecondary terminals when supplying full load secondary current atunity power factor, for a 4 kVA, 200/400 V, 50 Hz, single phasetransformer of which the following are the test results :

(ii)OC test (on primary) :

SC test (on secondary) : V = 17.5 V ; I = 9 A; W = 50 W*(may 2010)*

2.B. 5 (i) Explain the principle of operation of Single phase Transformer (8)

(ii) A 150 KVA, 2400/240 V Transformer has R2 = 0.002 ohm, X2 = 0.45 ohm. Calculate the primary induce emf. (8)*(may 2007)*

2.B.6. Explain the principle of operation of a single phase transformer and its behaviour on loaded condition with phasor diagram. *(nov2009)*

(i) Develop the equivalent circuit of a transformer. (8)

(ii) Explain the O.C. and S.C. tests done on a single phase transformer.*(nov2009)*

2.B. 7 (a) (i) Derive the emf equation of a transformer. (Marks 10)

(ii) A single phase transformer is rated at 240/120 V, 50 Hz, Find voltage and frequency of secondary at no-load (1) if primary voltage is 120 V, 25 Hz and (2) if primary voltage is 240 V dc. (Marks 6)*(nov 2010)*

2.B. 8 (i) Deduce the equivalent circuit of 1-ph transformer. (Marks 6)

(ii) A 1-ph transformer is rated at 10 KVA, 50 Hz. The secondary rated voltage is 240 V and the turns ratio is 10. The resistance and leakage reactant as referred to primary are 8.4 and 13.7 respectively. Find voltage regulation at full-load and power factors of 0.8 lagging, 0.8 leading and unity. (Marks 10) *(nov 2010)*