Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE205

Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100   Duration: 3 Hours

Graph sheets shall be provided
PART A
Answer all questions, each carries5 marks.   Marks

1	Dummy coils are not used in lap winding. Justify with suitable example	(5)
2	What is armature reaction? What are the effects of armature reaction on the performance of dc machine?	(5)
3	Derive the condition for gross mechanical power developed by motor is maximum?	(5)
4	Draw the phasor diagram of a practical transformer under no-load condition. Name the no-load components and write its equation.	(5)
5	A 11000/230V, 200kVA, 50Hz single phase transformer has core loss of 1200 W and copper loss of 1700 W at full load condition. Find the load in kVA at which maximum efficiency occurs?	(5)
6	What are the essential and desirable conditions to be satisfied for parallel operation of single phase transformers?	(5)
7	What is vector grouping? Name the vector groups commonly used in three phase transformers?	(5)
8	What is tertiary winding?	(5)

PART B
Answer any twofull questions, each carries10 marks.

9 a) There are 60 conductors in a 4 pole dc machine. Whether lap winding or wave winding is preferred? What type of coil arrangements needed in this armature core? (5)

   b) i. Y_B and Y_F should be odd number for simplex winding. Why? (2)

   ii. Find the back pitch and front pitch of a simplex 2-layer lap winding with 12 coils. Average pitch = 6, Resultant pitch = 2. (3)

10   The open circuit characteristics of a dc shunt generator running at 850 rpm is given below.

I_f (A)	0	0.8	1.6	2.4	3.2	4
Emf (V)	0	28	57	76	90	100

Calculate

   i.   emf to which the machine will excite, when the shunt field resistance is 22Ω

   ii. emf when an additional resistance of 8Ω is included in the shunt field circuit

   iii. shunt field resistance for a normal voltage of 100V

   iv. Critical speed with shunt field resistance for a voltage of 100V (5)

11 a) What is equalizer rings? Why it is generally used in lap windings instead of wave windings? (5)

   b) A long shunt compound generator supplies a load at 250V. The load consists of five motors each drawing 60A and a lighting load of 250 lamps at 100W each. The armature, series field and shunt field resistances are 0.01, 0.02 and 75Ω (5)

respectively. Find (i) load current (ii) armature current (iii) emf generated.

PART C
Answer any two full questions, each carries10 marks.

12 a) Explain the characteristics curves of a dc series motor with the help of relevant equations? (5)

    b) Why transformer rating is in kVA and not in KW? (5)

13 A 250V dc shunt motor takes 5A on no-load. The armature and field resistances are 1Ω and 125Ω respectively. Find its efficiency when it takes a line current of 25A. (10)

14 The OC and SC test results of a 5kVA, 200/400V, 50Hz single phase transformer is as follow.

OC Test			SC Test		
V_1 (V)	I_1 (A)	W_1 (W)	V_2 (V)	I_2 (A)	W_2 (W)
220	0.7	60	22	10	120

Draw the equivalent circuit of transformer as referred to low voltage side. (10)

PART D
Answer any twofull questions, each carries 10 marks.

15 a) Draw the circuit diagram of Sumpner's test and derive the equation for efficiency of each transformer? (5)

    b) Explain how the Scott connection can be used to obtain two phase supply from a three phase supply? (5)

16 a) The primary and secondary voltages of an autotransformer are 1200V and 600V respectively. Calculate the economy of Cu when the secondary current is 120A. Draw the circuit and show the current distribution in the winding. (5)

    b) Define all day efficiency of transformer. Why this efficiency is less than commercial efficiency? (5)

17 a) A 10 kVA, 200/400V, 50Hz single phase transformer gave the following result.

O.C test: 200V, 1.3A, 120W …………….on L.V side

S.C test: 22V, 30A, 200W …………….on H.V side

Calculate (i) the magnetising current and the component corresponding to core loss at normal frequency (ii) the magnetising branch impedances. (5)

    b) With the aid of three phase transformer connections and phasor diagram, explain the vector group Dy11. (5)

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