BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION, 2018

(2^{nd} Year, 2^{nd} Semester)

ELECTRICAL MACHINES – I

Time : Three hours | Full Marks : 100

(50 marks for each part)
(Use separate Answer Script for each part)

PART - I

Answer ANY THREE questions. Question No. 2 carries maximum marks

1. (a)	Draw a neat cross sectional view of a 4-pole DC machine and label the main parts. Name the different materials used to construct different parts of the machine made.	8
(b)	Why the pole shoes of DC machines are often laminated?	4
(c)	How are self excited generators classified? Draw their circuit diagrams.	4
2. (a)	Draw OCC of a DC shunt generator and define critical resistance and critical speed. Explain in details how a DC generator builds up its voltage. What is the limit of the voltage to which the machine can build up?	10
(b)	The OCC of a dc shunt generator driven at 300 rpm is as follows:	8

Field Current (A)	0	0.2	0.3	0.4	0.5	0.6	0.7
Open Circuit Voltage (V)	7.5	92.5	135.0	164.0	187.0	202.0	210.0

The field resistance is adjusted to 354.5 ohms and the speed remains at 300 rpm. Determine (i) no-load voltage, (ii) critical field resistance, and (iii) critical speed for the given resistance.

3. (a)	Derive an expression for torque produced in a dc motor.	6
(b)	What are the different no-load losses takes place in a dc machine? Mention the factors on which these losses depend upon. How are these losses reduced?	6
(c)	What are different methods available for controlling the speed of a dc shunt motor?	4
4. (a)	Show that a rotating magnetic field of constant amplitude can be produced by supplying a balanced three phase voltage source to a balanced three phase winding. What happens if the phase sequence is changed?	8
(b)	Why a 3 phase Induction motor always runs at some sub-synchronous speed? What is slip? Derive the expression for the frequency of rotor current in terms of supply frequency and slip.	8
5. (a)	Derive an expression for induced emf of a synchronous generator.	6
(b)	What is the pitch factor? Derive expressions for pitch factor.	5
(c)	What are the advantages of stationary armature and revolving field system in large and medium sized synchronous generators?	5

Ref No: EX/EE/T/222/2018(Old)

B. E. ELECTRICAL ENGINEERING SECOND YEAR 2ND SEMESTER (OLD), 2018

SUBJECT: - ELECTRICAL MACHINES-I

Time: ~~Two hours~~/Three hours/ ~~Four hours/ Six hours~~

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

PART II

Answer **Question no. 6** and any two Questions from the rest

All questions carry equal marks

Two marks reserved for neatness

Q6. Justify the statements, with proper correction, if necessary (any four) 4X4

a) Stepped core is used for large transformer to reduce material cost and weight.

b) To minimize the cost transposition of conductors is done when parallel conductors are used .

c) Buchholz's relay can protect a transformer from any type of winding fault.

d) Double gaps are provided in arching horn for ease of fitting in small space.

e) Explosion vent is provided at the top lead of transformer to protect from lightning.

f) CRGOS is used for construction of transformer core.

Q7. a) From the basic principle develop equivalent circuit of a single phase transformer. State the assumptions clearly. 8

b) Describe test methods to determine equivalent circuit parameters of a single phase transformer. 8

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B. E. ELECTRICAL ENGINEERING SECOND YEAR 2ND SEMESTER (OLD), 2018

SUBJECT: - ELECTRICAL MACHINES-I

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Q8. a) Explain the operating principle of an auto transformer. Develop the equivalent circuit of a single phase auto transformer. Why is it not used as power or distribution transformer in power distribution system? 4+4+2

b) A 20 kVA , 2300 V/ 230 V , two winding transformer is to be used as a step-up auto-transformer, with constant source voltage of 2300 V. If the efficiency of the two-winding transformer at 0.8 p.f. is 96%, find the autotransformer efficiency at the same p.f. 6

Q9. a) Discuss the conditions necessary for the successful parallel operation of single phase transformer 8

b) Under what condition a transformer attains maximum efficiency. Derive an expression for maximum efficiency in terms of rated kVA, rated copper loss, rated core loss .

Q10. Write short notes on any Two 8+8

a) All day efficiency of a distribution transformer.

b) Inrush current of a transformer

c) Magnetizing current of a transformer.