

B.ELECTRICAL ENGG(EVENING) 2nd YEAR 1st SEM EXAMINATION,2018

(1ST Semester/Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual)

SUBJECT ELECTRICAL MACHINE--I

(Name in full)

PAPER

Full Marks 30/ 100

(15/50 marks for each part)

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

Use a separate Answer-Script for each part

PART -- I

No. of questions	Answer any three from the following.	Marks
1)	Answer any six statements from the following with proper correction if require.	6x3
a)	Cross over or continuous coil is used in sandwich winding.	
b)	Use of stepped core reduces copper cost, weight and total cost of transformer.	
c)	Interleaved joint is recommended for large transformer.	
d)	Lamination is used to reduce iron loss and voltage regulation.	
e)	Use of higher class of insulation in the winding increases efficiency and reduces cost.	
f)	Cost of distribution transformer is higher than power transformer.	
g)	Transposition of conductors in winding reduces cost and voltage regulation of a transformer.	
h)	Cost of dry type transformer is lower than oil cooled transformer as extra cooling device is not require.	
i)	Use of capacitive load at output increases voltage regulation and efficiency of a transformer.	
2)a)	Explain the operating principle of a single phase transformer. Develop E M F equation of a transformer.	8x2=16
b)	A 10 KVA 440/110 volt 50 Hz single phase transformer has the following constants, $R_1=0.5$ ohm, $R_2=0.032$ ohm and $X_1=0.9$ ohm, $X_2=0.06$ ohm respectively. At no load the current on 440 v side is 0.5 A and core loss is 110 W. Compute the change in primary voltage require to maintain the rated voltage when 20% over load at 0.8 pf lagging.	
3)a)	Develop the equivalent circuit of a single phase transformer and mention the assumptions taken and also draw the phasor diagram at lagging pf load.	8x2=16
b)	Two single phase transformer operate in parallel to supply a load of $44+j16.6$ ohm .The A transformer has secondary emf of 600 V on open circuit with an internal impedance of $1.8+j5.6$ ohm referred to secondary and corresponding figure for transformer B are 610V and $1.8+j7.4$ ohm. Calculate the terminal voltage , current and power factor of each transformer.	8x2=16
4)a)	Establish the condition for maximum efficiency of a transformer with variation of load current. And also calculate the value of load current at that condition.	
b)	A 500 KVA transformer has 95% efficiency at full load and also 60% of full load at upf. Calculate transformer losses and efficiency at 75% load at upf.	

5a)	<p>Derive the expression of equivalent circuit resistance and reactance of an autotransformer.</p> <p>A 5 KVA, 2200V/220V single phase transformer has the following parameters:</p> <p>b) H. V. side : $r_1 = 3.4 \Omega$ $X_1 = 7.2 \Omega$ L. V. side : $r_2 = 0.028 \Omega$ $X_2 = 0.060 \Omega$</p> <p>The transformer is made to deliver rated current at 0.8 lagging power factor, to a load connected on the l.v. side. If the load voltage is 220V, Calculate the terminal Voltage on the high voltage side.</p>	8x2=16
-----	--	--------

Ref No. :Ex/ EE/5/T/212/2018

Bachelor of Electrical Engineering (Evening) 2ND Year
1ST Semester Examination, 2018

SUBJECT: ELECTRICAL MACHINES - I

Page 1 of 2

Time: Three Hours

Full Marks: 100 (50 each part)

Use a separate Answer-Script for each part.

Question No.	PART - II	Marks
	Answer Question No.1 and any two from the rest.	
1.		
i)	Wave connected D.C. machines require equalizer connection-Justify.	6x3
ii)	Due to armature reaction the magnetic neutral axis shifted in the direction of rotation for a D.C. generator-Justify.	
iii)	D.C. series motor can be operated under no-load condition-Justify.	
iv)	For high current and low voltage D.C. machines, wave connection is preferred-Justify.	
v)	D.C. shunt generator has poor voltage regulation than the separately excited D.C. generator-Explain.	
vi)	Swinburnes method of testing of D.C. machines can be performed on D.C. series motor-Justify.	
2.		
(i)	What are the effects of armature reaction in D.C. machines and what are the methods for reducing the effects of armature reaction ?	8
(ii)	Explain the commutation process in D.C. machine and what are the roles of interpole in the commutation process in D.C. machine?	8
3.		
(i)	Derive the expression of torque in D.C. motor.	8
(ii)	A 220 V shunt motor on no—load runs at 1000 rpm and takes 10 A. The total armature and shunt field resistances are respectively 0.3 ohm and 220 ohms. Calculate the speed when loaded and taking a current of 50 A, if armature reaction weakens the field by 3%.	8

[Turn over

- 4
- (i) Derive the torque-current characteristics of a D.C. shunt motor. Why D.C. series motor is preferred in traction drive? 8
- (ii) A shunt machine, connected to 250 V mains has an armature resistance of 0.14 ohm and resistance of the field is 125 ohms. Find the ratio of the speed as generator to the speed as a motor, the line current in each case being 90 A. 8
5. Write short notes on any two of the following: 8X2
- (i) Parallel operation of D.C. shunt generators.
- (ii) Hopkinsons method of testing of D.C. machines.
- (iii) Speed control of D.C. motors.