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RETEST EXAMINATION - 2019

Semester : 4th

Subject Code : CAI-402

ELECTRICAL MACHINES AND CONTROL

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Instructions :

1. All questions of PART-A are compulsory.
2. Answer any five questions from PART-B.

PART – A

Marks – 25

1. Fill in the blanks : $1 \times 10 = 10$

- (a) Transformer action requires _____ magnetic flux.
- (b) _____ is determined from open circuit test.

[Turn over]

(c) Two windings of a transformer are designated as primary winding and _____ winding.

(d) The power factor of an AC circuit is given by _____ power divided by _____ power.

(e) The emf induced in the armature of a DC machine is _____ to the flux and _____ to the speed.

(f) The commutator segments of a DC machine are made up of _____.

(g) The stator of a 3-phase induction motor produces _____ magnetic field.

(h) The single-phase series motor can operate on both _____ and _____.

(i) An over excited synchronous motor running on no-load is known as _____.

(j) A single-phase induction motor employs _____ rotor.

2. Write true or false : $1 \times 10 = 10$

(a) An ideal transformer is one which has no losses and leakage reactance.

(b) A transformer transfers electrical energy from primary to secondary usually with a change in frequency.

(c) The core of a transformer is made of aluminium.

(d) The emf induced in the windings of a transformer will be in-phase with the core flux.

(e) The armature of a DC machine is made up of laminated sheets to reduce hysteresis loss.

(f) Armature reaction is increased when the armature current increases.

(g) In a clockwise rotating loaded DC generator, brushes have to be shifted anticlockwise.

(h) The value of back emf (Eb) in a DC motor is maximum at no-load.

- (i) In a three phase induction motor, three-phase supply is to be given to stator winding and DC supply to the rotor winding.
 - (j) The rotor winding of a 3-phase wound rotor is generally delta connected

3. Choose the correct answer : $1 \times 5 = 5$

- (c) In the three phase induction motors, the rotor current frequency is

 - (i) f/s
 - (ii) sf
 - (iii) $\sqrt{s}f$
 - (iv) s^2f

(a) A two winding transformer operates at maximum efficiency when its

- (i) hysteresis loss equals to eddy current loss
 - (ii) copper loss equals to iron loss
 - (iii) primary resistance equals to secondary resistance
 - (iv) voltage regulation is minimum

(b) The core of a transformer is assembled with laminated sheets to reduce

- (i) Hysteresis loss
 - (ii) Eddy-current loss
 - (iii) Magnetic noise
 - (iv) Magnetising current

(e) A stepper motor is a

- (i) DC motor
 - (ii) single-phase AC motor
 - (iii) two-phase motor
 - (iv) multi-phase motor



PART – B

Marks – 45

4. (a) Write the relation between phase voltage and line voltage in delta connected three phase system. 3
- (b) Derive the relation between phase voltages and line voltages in star connected three phase system. Also draw the phasor diagram of star connected three phase system showing the phase voltages and line voltages. 3+3=6
5. (a) What is an ideal transformer ? 3
- (b) Draw the complete phasor diagram of a transformer on load. 3
- (c) A single phase transformer rating is 11500 V / 2300 V, 100 kVA. Calculate the rated current in primary winding and secondary winding. 3
6. (a) Describe the constructional details of commutator of a DC machine. 3
- (b) Derive the emf equation of a DC generator. 3
7. (a) Describe the constructional features of squirrel cage induction motor. 3
- (b) Describe the principle of operation of a three phase induction motor. 3
- (c) A 3-phase, 50 Hz induction motor has a full load speed of 960 rpm. Calculate
- number of poles
 - slip frequency
 - speed of rotor field with respect to rotor structure.
- 3+3=6

8. (a) What are the types of single-phase induction motor ? 3

- (b) Describe the essential construction features of the permanent-magnet stepper motor. 3



- (c) Calculate the stepping angle for
(i) a 3-phase, 16 tooth rotor VR motor
(ii) a 3-phase, 24-pole PM motor. 3

9. Write short notes on any *three* : $3 \times 3 = 9$

- (a) Interpoles
- (b) Open circuit test of transformer
- (c) Capacitor start capacitor run single-phase induction motor
- (d) Power measurement by two wattmeter method in 3-phase circuits.

