

FIFTH SEMESTER
 SUPPLEMENTARY EXAMINATION
 CEE-309 SPECIAL ELECTRICAL MACHINES

B.Tech. (EVENING)

FEB-2019

-240-

Time: 3:00 Hours

Max. Marks: 40

Note: Answer ALL questions. All carry equal marks. Assume suitable missing data, if any.

- Q (1) Explain with a help of suitable theory why a single phase single winding asynchronous motor produces no starting torque. State and describe various practicable arrangements of split phase starting methods with help of vector diagram, to make the single-phase Asynchronous Motor self-starting.
- Q (2) A (1/2) kW, 4-pole, 50 Hz, 220 V, two-value capacitor motor has the following circuit model parameters: $R_{1m} = 4.2\Omega$, $R_{1a} = 5.16\Omega$, $X_{1m} = 11.3\Omega$, $X_{1a} = 12.1\Omega$, $X = 250\Omega$, $a = 1.05\Omega$, $R_2 = 7.48\Omega$, $X_2 = 7.2\Omega$. Friction, windage and core losses = 45 W. Calculate the starting torque and current if the two capacitors in parallel equal to $70\ \mu F$.
- Q (3) For a 230V, 1-phase asynchronous motor have the parameters of equivalent circuit shown in Fig.1, are $R_1 = R_2 = 8\Omega$, $X_1 = X_2 = 12\Omega$, $X_m = 200\Omega$. At a slip of 4%, calculate (a) input current (b) input power (c) developed power and (d) developed torque at rated voltage. The motor speed is 1728 rpm.

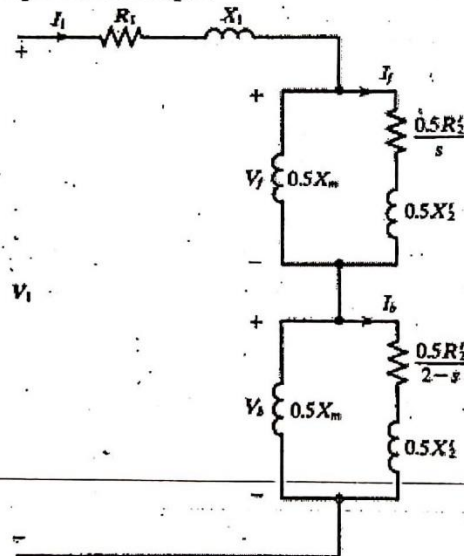


Fig.1

- Q (4) Draw the phasor diagram of Universal motor with compensated winding. Find out the expression for ratio of speeds when operated on DC & AC supplies.
- Q (5) A universal motor takes 1A from 220V DC supply while running at 2000 rpm. Find the speed and power factor when it is connected 230V AC 50Hz supply drawing the same current. The total resistance and inductance are 20Ω and 0.4 H respectively.
- Q (6) Explain the construction and working of permanent magnet stepper motor. A stepper motor has a step angle of 1.8° . Find (a) resolution (b) number of steps required for 50 revolutions and (c) shaft speed if the stepping frequency is 5000 pulse/sec.
- Q (7) Compare the BLDC motor with conventional BDC motor? A BLDC motor has a no-load speed of 6000rpm when connected to 120V DC supply. Armature resistance is 2.5Ω . Find the speed when it is supplied with 60V and developing a torque of 0.5 N-m. Neglect constant losses. The no-load current is 1A.
- Q (8) Derive the transfer function of a field controlled DC servomotor and armature controlled DC servomotor along with Block diagram.