GANPAT UNIVERSITY
B.TECH III SEM (BM&I) REGULAR EXAMINATION NOV-DEC 2010
BME – 303: ELECTRICAL MACHINES AND ELECTRO ACTUATORS

Time: 3 Hours **Marks: 70**

Instructions:
1. All the questions are compulsory.
2. Answer to the question of each section must be written in separate answer books.
3. Figures to the right indicate marks.
4. Assume data, if needed.

SECTION-I

Q.1 **(a)** Explain the principle of operation of a single phase transformer and derive its E.M.F. equation. **[6]**

(b) Explain how rotating magnetic field is produced in a three phase induction motor with the help of neat diagram. **[6]**

OR

Q.1 **(a)** Draw and explain the Open circuit and short circuit test of a single phase transformer. **[6]**

(b) Explain the working principle and the constructional details of a three phase induction motor. **[6]**

Q.2 **(a)** A 500 KVA, 5KV/500V 1-ph transformer has resistance of primary and secondary windings, R1=0.5, R2=0.001.The iron loss is 2.5 KW. If the load p.f. is 0.8 lag. Calculate the efficiency of the transformer at full load and half full load. **[6]**

(b) A 5 KVA distribution transformer is loaded as following during a day of 24 hours. The iron loss is 3KW and the full load copper loss is 6KW.Find the all-day efficiency. **[6]**

No. of hours	Loading in KW	P.f.
8	400	0.8
9	300	0.75
4	100	0.8
3	0	-

OR

Q.2 **(a)** A 600KVA, 1-ph transformer has an efficiency of 92% both at full-load and half-load at unity power factor. Determine its efficiency at 60% of full-load at 0.8 p.f. lag. **[6]**

(b) Obtain the equivalent circuit of a 200/400 V, 50 Hz, 1-phase transformer from the following test data: **[6]**

O.C.Test(LV)Side : 200V, 0.7A, 70W
S.C.Test(HV)Side : 15V, 10A, 85W

Q.3 Draw and explain the working of various types of single phase induction motors. **[11]**

SECTION-II

Q.4

(a) Draw and explain the construction of a DC machine with the help of neat diagram. **[6]**

(b) Explain DC machine losses in detail. **[6]**

OR

Q.4

(a) Derive the equation for EMF generated in an armature of a DC generator. Also define pole pitch, coil pitch, full pitch. **[6]**

(b) Draw and explain the internal and external characteristics of DC shunt and series generator. Enlist the application of each. **[6]**

Q.5

(a) Explain the working principle and the constructional details of a three point starter. **[6]**

(b) The armature supply voltage of a DC motor is 230 V, the armature current is 12 A, the armature resistance is 0.8 Ω, and the speed is 100 rad/sec. Calculate 1)the induced emf, 2)the electromagnetic torque, 3)the electrical power input to the armature 4)the mechanical power developed by the armature, and 4) armature copper loss. **[6]**

OR

Q.5

(a) Draw the schematic diagram of relay and explain its working. **[6]**

(b) A DC generator is connected to 220 V DC mains. The current delivered by the generator is 100 A. The armature resistance is 0.1 Ω. the generator is driven at the speed of 400 r.p.m. Calculate 1)induced emf, 2) electromagnetic torque, 3) mechanical power input to the armature, 4) power input and output of armature when the speed drop is 350 r.p.m. State whether the motor is acting as a generator as motor. Assume constant flux. **[6]**

Q.6 Explain the constructional details and the working principle of a variable reluctance stepper motor. **[11]**

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