

GANPAT UNIVERSITY
B.TECH SEM-V (ELECTRICAL)
REGULAR EXAMINATION NOV-DEC-2016
2EE501:- ROTATING A.C. ELECTRICAL MACHINES

Time: 3 Hours

Total Marks:-60

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.

(2) Figures on right indicate marks.

(3) Be precise and to the point in answering the descriptive questions.

(4) Make suitable assumptions wherever necessary

SECTION-I

- Que-1 (A)** Draw the circle diagram for a three phase, 29.84 kW, 415 V, 50 Hz, delta-connected induction motor from the following data: [07]
 No-load test: 415 V; 21 A; 1250 W
 Blocked rotor test: 100 V; 45 A; 2730 W
 Estimate from the diagram for full load condition, the slip, efficiency and power factor. The rotor copper loss at standstill is half of the total copper loss.
- (B)** What is slip of a three phase induction motor? Discuss its slip-torque characteristics. [03]

OR

- Que-1 (A)** Drive torque equation for three phase induction motor. Also derive condition for maximum torque and equation for maximum torque. [05]
- (B)** A 2-pole, 240V, 50Hz single phase induction motor has the following constant referred to the stator: $R_1=2.2\Omega$; $X_1=3.0\Omega$; $R'_2=3.8\Omega$; $X'_2=2.1\Omega$; $X_m=86\Omega$ Find the stator current and input power when the motor is operating at a full load speed of 2820 r.p.m. If the iron and friction losses amount to 50W, Find total mechanical power developed, useful shaft torque and efficiency. [05]
- Que- 2 (A)** Explain star delta starter with necessary diagram and equations. [04]
- (B)** Discuss no load test on three phase induction motor. How to separate various losses from no load input power ? [03]
- (C)** The rotor of a 4 pole, 50 Hz slip ring induction motor has a resistance of 0.3 Ω /phase and runs at 1440 rpm at full load. Calculate the external resistance per phase which must be added to lower the speed to 1320 rpm, the torque being the same as before. [03]

OR

- Que- 2 (A)** Discuss cogging of an induction motor. [03]
- (B)** What is harmonics ? Prove that fifth harmonic has negative phase sequence while seventh has positive. [03]
- (C)** A 6 pole, three phase induction motor develops a power of 22.38 KW, including mechanical losses which total 1.492 KW at a speed of 950 rpm on 550 V, 50 Hz mains. The power factor is 0.88. Calculate for this load (i) the slip (ii) the rotor copper loss (iii) the total input if the stator losses are 2000 W (iv) the efficiency (v) the line current. [04]

Que-3 Attempt the following questions.

- (A) Draw and explain equivalent circuit of single phase induction motor. [03]
(B) Prove that single phase induction motor is not self starting. [03]
(C) Discuss double squirrel cage induction motor with necessary diagrams. [04]

SECTION-II

Que-4 (A) Why is it necessary to run alternators in parallel? Explain and derive the equation of synchronizing current, synchronizing power and synchronizing torque for synchronous machine. [05]

(B) A 50 KVA, 500V, single phase a.c generator gave the following result in the open and short circuit tests: [05]

Field current (Amps)	:	5	10	15	20	25	30
E.M.F (volts)	:	125	250	370	480	566	640
S.C Armature current (Amps)	:	73	146	220	-	-	-

Using the ampere- turn method, find the full-load voltage regulation at (i) unity p.f.
(ii) p.f. 0.8 lagging (iii) p.f 0.8 leading. Effective armature resistance is 0.2Ω

OR

Que-4 (A) Two alternators A and B operate in parallel and supply a load of 15 MW at 0.85 p.f lagging (a) By adjusting steam supply of A, its power output is adjusted to 7500 KW and by changing its excitation, its p.f is adjusted to 0.94 lag. Find the p.f of alternator B. (b) If steam supply of both the machine is left unchanged, but excitation of B is reduced so that its p.f becomes 0.95 lead, find new p.f of A. [05]

(B) What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator. [05]

Que-5 (A) Discuss voltage regulation. Explain any method to find out the voltage regulation of alternator. [05]

(B) Explain the construction and working principle of stepper motor. [05]

OR

Que-5 (A) Discuss the effect of excitation on armature current and power factor. [04]

(B) Explain the working of synchronous motor in different excitations with vector diagram. [03]

(C) Why synchronous motor is not self-starting? Explain the methods of starting of Synchronous motor. [03]

Que-6 Attempt the following questions.

(A) What are the advantages of stationary armature and rotating field type of alternators compared to the other type? Explain types of rotors used in alternator of rotating field type with figure. [04]

(B) Draw and explain V curve of synchronous motor. [03]

(C) Discuss distribution factor and derive $K_d = \frac{\sin m\beta/2}{m \sin \beta/2}$ [03]

END OF PAPER

Best of Luck