Exam No: _____

GANPAT UNIVERSITY
B. TECH SEM- IV (MARINE ENGINEERING)
REGULAR EXAMINATION APRIL-JUNE 2017
2MR401: ALTERNATORS & MOTORS

TIME: 3 HRS **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.

SECTION- I

Que.-1 **(A)** Derive EMF equation of synchronous generator. **[05]**

(B) A part of an alternator winding consists of six coils in series, each coil having an e.m.f. of 10 V r.m.s. induced in it. The coils are placed in successive slots and between each slot and the next, there is an electrical phase displacement of 30°. Find graphically or by calculation, the e.m.f. of the six coils in series. **[05]**

OR

Que.-1 **(A)** Explain in brief construction & working of alternator. **[05]**

(B) Find the value of k_d for an alternator with 9 slots per pole for the following cases: (i) One winding in all the slots (ii) one winding using only the first 2/3 of the slots/pole (iii) three equal windings placed sequentially in 60° group. **[05]**

Que.-2 **(A)** List out the condition for parallel operation of alternator & Explain dark lamp method. **[05]**

(B) Explain Method of Starting for Synchronous Motor. **[05]**

OR

Que.-2 **(A)** Find the no-load phase and line voltage of a star-connected, 4-pole alternator having flux per pole of 0.1 W_b sinusoidal distributed; 4 slots per pole per phase, 4 conductors per slot, double-layer winding with a coil span of 150°. **[05]**

(B) Draw & Explain the Equivalent circuit of Alternator. **[05]**

Que.-3 **Attempt the following questions**

(A) Calculate the speed and open-circuit line and phase voltages of a 4-pole, 3-phase, 50-Hz, star-connected Alternator with 36 slots and 30 conductors per slot. The flux per pole is 0.0496 Wb and is sinusoidal distributed. **[04]**

(B) Explain Effect of Harmonics on Pitch and Distribution Factors. **[02]**

(C) A 3-phase, 16-pole alternator has a star-connected winding with 144 slots and 10 conductors per slot. The flux per pole is 30 mWb sinusoidal distributed. Find the frequency, the phase and line voltage if the speed is 375 rpm. **[04]**

SECTION-II

Que.-4 **(A)** Comparison Synchronous and Induction Motor. **[05]**

(B) Explain Hunting & V-Curve of Synchronous Motor. **[05]**

OR

Que.-4 **(A)** Explain Synchronous Motor Application & Explain in details synchronous condenser. **[05]**

(B) Draw and explain Power stages of induction motor. Give equations of powers and losses. **[05]**

Que.-5 **(A)** A 3Φ induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate (i) Synchronous Speed (ii) Rotor Speed, when slip is 4% (iii) Rotor frequency when rotor runs at 600 rpm. **[05]**

(B) Compare Squirrel cage induction motor and Slip ring induction motor. **[05]**

OR

Que.-5 **(A)** Derive equation of starting torque and condition for max. Starting torque of Induction Motor. **[05]**

(B) A 3Φ induction motor having star connected rotor has an induced e.m.f. of 80 volts between slip rings at standstill on open circuit. The rotor has resistance and reactance per phase of 1Ω and 4Ω respectively. Calculate current/phase and power factor when (i) slip rings are short circuited (ii) slip rings are connected to a star connected rheostat of 3Ω/phase. **[05]**

Que.-6 **Attempt the following questions**

(A) Discuss Working principle and construction of three phase Induction motor. **[03]**

(B) List out Starting Methods of 3 phase Induction Motor & Explain any one method for starting of 3 phase induction motor. **[04]**

(C) An 1100-V, 50 Hz delta connected induction motor has star connected slip rings with transformation ratio 3.8. The rotor resistance and standstill leakage reactance are 0.012Ω and 0.25Ω per phase respectively. Neglect Stator Impedance and Magnetizing Current. Determine:- **[03]**

(i)Rotor Current at start with slip ring shorted

(ii)Rotor p.f. at start with slip ring shorted

(iii)Rotor Current at 4% slip with slip ring shorted

(iv)Rotor p.f. at 4% slip with slip ring shorted

END OF PAPER