

GANPAT UNIVERSITY
B.TECH SEM. III ELECTRONICS & COMMUNICATION ENGINEERING
REGULAR EXAMINATION NOVEMBER- 2014
2EE303: ELECTRICAL ENGINEERING

TIME:-3 Hours

TOTAL MARKS-70

INSTRUCTIONS:-

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Answer to two sections must be written in separate answer books.
4. Figures to the right indicate full marks.

Section-I

- Que-1**
- (a) Deduce the condition of maximum efficiency of transformer and also explain various types of losses of transformer. (06)
- (b) Obtain the equivalent circuit of a 200/400 V, 50Hz 1- Φ transformer from the following test data: (06)
- O.C test: 200V, 0.7A, 70W on L.V side
 S.C test: 15V, 10A, 85W on H.V side
- Calculate the secondary voltage when delivering 5Kw at 0.8 p.f lagging the primary voltage being 200V.

OR

- (a) Illustrate by an example: How voltage regulation and efficiency of transformer can be calculated from the readings of O.C. & S.C. test? (06)
- (b) A 1 Φ , 500/250V, 10 kVA transformer delivers 9 kVA at unity p.f. and has its maximum efficiency of 94%. Estimate its efficiency when delivering its full load output at p.f. 0.707 lagging. (06)

- Que-2**
- (a) 440V, 3 Φ , 50 Hz, 4-pole, Y- connected induction motor has a full load speed of 1425 rpm. The rotor has impedance of $(0.4 + j 4) \Omega$ and transformation ratio of 0.8. Calculate (1) full load torque (2) rotor current and rotor C_u loss (3) power output if windage and friction loss is 500 W (4) starting current (5) starting torque. (05)
- (b) Derive the torque equation for 3- Φ induction motor under running condition and discuss the effect of power factor on torque value. Prove that maximum torque is independent of rotor resistance. (06)

OR

- Que-2**
- (a) Why does 3- Φ Induction motor require starter? List out various starters used for induction motor and draw diagram of Star-Delta starter. (04)
- (b) Define slip and prove that induction motor copper losses are proportional to the product of slip and rotor input. (03)
- (c) A 4-pole, 3- Φ induction motor operates from a supply whose frequency is 50 Hz. Calculate (i) the speed at which the magnetic field of the stator is rotating (ii) the speed of the rotor when the slip is 0.04. (04)

- Que-3** **Attempt any three.** (12)
- (a) Show the constructional and operational differences between Squirrel cage IM and slip ring IM.
 - (b) Explain the role of different components of Hydro Power plant by using its schematic diagram.
 - (c) How does an autotransformer save the copper material compare to ordinary double winding transformer? Explain.
 - (d) Justify by using Double-field revolving theory "1-phase induction motor is not self-starting machine."

Section-II

- Que-4** (a) Suggest the methods preferable to control the speed of DC machine above and below the rated speed. Also discuss them in short. (05)
- (b) A long shunt DC compound motor takes a current of 40 amp. at 440 volt supply. Shunt field resistance is 220Ω , series field resistance is 0.2Ω and armature resistance is 0.3Ω . If iron and friction losses are 1500 watts, find the efficiency and output developed of the motor. (05)
- (c) Clarify the role of pole shoes and commutator in DC machine. (02)

OR

- Que-4** (a) Elaborate the various characteristics of DC shunt motor and its field of applications. (05)
- (b) A 6 pole generator has 400 armature conductors and useful flux is 0.06 Wb . If this generator is lap wound and running at 1000 rpm, what speed it would run so that it may induce the same voltage? (05)
- (c) Draw three point starter used for DC motor. (02)

- Que-5** (a) Explain the effect of change in excitation on armature current and power factor on Synchronous motor. (05)
- (b) What is meant by breadth factor? Give formulae to calculate it. (02)
- (c) Discuss the synchronous impedance method for voltage regulation for alternator. (04)

OR

- Que-5** (a) In a 50 kVA, star connected, 440 v alternator, the effective armature resistance is 0.25Ω per phase. The synchronous reactance is 3.2Ω per phase and leakage reactance is 0.5Ω per phase. Determine at rated load and unity power factor;
(a) Internal emf E_a (b) no-load emf E_o (c) % regulation on full load. (04)
- (b) Deduce the relationship between speed and frequency of an alternator. (02)
- (c) Describe an operation of synchronous motor on load and on no-load with the help of vectors. (04)

- Que-6** **Attempt any three.** (12)
- (a) What type of windings can be done on an armature of DC generator? Compare them.
 - (b) Write a short note on High Rupturing Capacity fuses.
 - (c) Explain the construction and working of synchronous generator.
 - (d) Discuss briefly about SF₆ circuit Breaker and advantages of SF₆ gas.

END OF THE PAPER

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