Code No. BTS 118 (A)

B.TECH. DEGREE III SEMESTER (SUPPLEMENTARY) EXAMINATION IN INFORMATION TECHNOLOGY/ COMPUTER SCIENCE AND ENGINEERING
JUNE 2001

**IT/CS 304 ELECTRICAL TECHNOLOGY**
*(1998 Admissions)*

Time: 3 Hours Maximum Marks: 100

(All questions carry ***equal*** marks)

I. (a) Explain the various losses taking place in a transformer. How are they minimized?

(b) A 100KVA, 1000/10,000V, 50 Hz single phase transformer has an iron loss of 1100W. The copper loss with 5A in the high voltage winding is 400W. Calculate the efficiency at 50% of normal load at a power factor of 0.8, the output terminal voltage being maintained at 10000V. Find also the load at which the efficiency is maximum.

**OR**

II. (a) Explain the working principle of an autotransformer. How the saving of copper is effected in it?

(b) A single phase, 250/500V transformer gave the following results:

OC test : 250V, 1A, 80W on $\ell v$ side

SC test : 20V, 12A, 100W on $hv$ side

Calculate the circuit constants and show them on an equivalent circuit.



III. (a) Explain the different methods of excitation of DC Generators with suitable diagrams.

(b) The no load saturation curve for a generator operating at 1800 rpm is given by the following data:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Eg.: | 8 | 40 | 74 | 113 | 152 | 213 | 234 | 248 | 266 | 278 |
| If: | 0 | 0.5 | 1.0 | 1.5 | 2.0 | 3.0 | 3.5 | 4.0 | 5.0 | 6.0 |

(i) Plot the no load saturation curve for 1500 rpm.

(ii) Calculate the generated voltage, when the generator is operating on no load with a field current of 4.6A and at a speed of 1000 rpm.

**OR**

IV. (a) Explain the function of commutator in a DC machine for motoring and generating action.

(b) A 4-pole DC shunt generator with wave connected armature has 41 slots and 12 conductors per slot. Armature resistance = 0.5 Ω , shunt field resistance = 200 Ω and flux per pole 125 mwb. When the generator is driven at 1000 rpm, calculate the voltage across a 10 Ω load resistance connected across the armature terminals.

V. (a) Explain the application of DC motors, based on their characteristics.

(b) A DC shunt generator delivers 60 kW at 250V when running at 500 rpm. The armature and field resistances are 0.03 Ω and 125 Ω respectively. Calculate the speed of the same machine when running as a shunt motor and taking 60 kW at 250V.

**OR**

***(Turn over)***

VI. (a) Explain the need of a starter in a DC motor.

(b) The armature of a 4-pole DC motor has a lap connected winding with 740 conductors. The flux per pole at no load is 25 mwb. Calculate the torque developed if the armature current is 50A and the effect of armature reaction is to reduce the flux by 3%.

VII. (a) Derive the expression for the voltage induced in an alternator. Discuss the role of the different factors which appear in the expression.

(b) A 6 pole 3 phase 50 Hz Y - connected alternator has 12 slots per pole and 4 conductors per slot. The winding is 5/6 full pitch. A flux of 25 mwb is sinusoidally distributed along the air-gap. Determine the line emf.

**OR**

VIII. (a) What is meant by voltage-regulation? Draw the phasor diagrams of an alternator at unity, lagging and leading power factors.

(b) A 600 V, 60 KVA single phase alternator has an effective resistance of 0.2 Ω . A field current of 10A produces an armature current of 210A on short circuit and an e.m.f. of 480V on open circuit. Calculate,

(i) Synchronous impedance and reactance

(ii) Full load regulation with 0.8 p.f. lagging.

IX. (a) Show that a rotating magnetic field can be produced by the use of 3 phase currents of equal magnitude.

(b) A 3 phase slip ring induction motor gives a reading of 60V across slip rings when at rest with normal stator voltage applied. The rotor is star connected and has an impedance of $(0.8 + j6)\ \Omega$ per phase. Find the rotor current when the machine is -

(i) at stand still with the slip rings joined to a star connected starter with a phase impedance of $(4 + j3)\ \Omega$, and

(ii) running normally with a 5% slip.

**OR**

X. (a) Explain the method of phase splitting in single phase induction motors.

(b) The power input to the rotor of a 440V, 50 Hz, 3 phase, 6 pole induction motor is 50 kW. It is observed that the rotor e.m.f. makes 120 complete cycles per minute. Calculate,

(i) Slip

(ii) Rotor speed, and

(iii) Mechanical power developed

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