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(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 121111/ 121121 | Roll No. | | | | | | | | | |

B.Tech.

(SEM. I) THEORY EXAMINATION, 2015-16

ELECTRICAL ENGINEERING

Time : 3 hours] [Total Marks : 100

Section-A

1. Attempt **all** questions. (2×10=20)

(a) Define linear and non-linear elements.

(b) In an a.c. circuit the supply voltage and current is given as:

v= 200 sin 314t and i =5sin (314t-II/3). Find the real power of the circuit.

(c) Draw the resonance curve for series resonant circuit and indicate fr, $_{\Delta}$ f, f_1, f_2, on the curve.

(d) What is the principle of superposition?

(e) For a single phase transformer, if iron losses are 1000W and the full load copper losses are 1500W, then at what percent load, the transformer will yield maximum efficiency?

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(f) Calculate the value of equivalent star connected resistances if 3 resistances each of 9Ω are connected in delta.

(g) Draw the single line diagram of electrical power system.

(h) Draw the speed Torque characteristics of D.C. Shunt motors.

(i) Draw the schematic diagram of long shunt type cumulative compound dc motor.

(j) Considering RYB as positive phase sequence write the type of phase sequence for the following phase combinations: BRY, RBY, BYR, and YBR.

Section-B

2. Attempt **any five** questions. 10×5=50

2. State Thevenin's theorem. Draw the Thevenin's equivalent circuit of Fig-1.

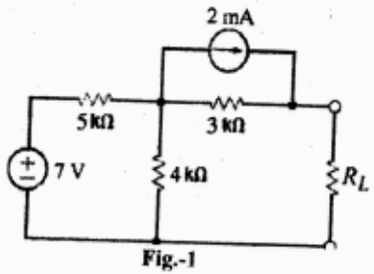

Fig.-1

3. State and prove Maximum Power Transfer theorem. Illustrate the theorem by solving a circuit of your choice.

4. Draw and explain torque-slip characteristics of a three phase induction motor.

A3Ø, 60 Hz, Induction motor has 6 poles and operates with a slip of 5% at a certain load Determine

a) The speed of the rotor w.r.t. stator.

b) The frequency of the rotor current.

c) The speed of the rotor magnetic field w.r.t. rotor.

d) The speed of the rotor magnetic field w.r.t. stator.

e) The speed of thr rotor magnetic field w.r.t. the stator magnetic field.

5. Derive the expression for line voltage and phase voltage, line current and phase current, active power, reactive power and apparent power for a star (Y) connected system with suitable circuit and phasor diagrams.

6. A 30 kV A, 2000/200V, single phase, 50 Hz transformer has R_1 = 3.5 phms, X_1 = 4.5 ohms and R_2 = 3.5 ohms X_2= 0.02 ohms. Find the equivalent resistance, reactance and impendance of transformer referred to primary side and secondary side. Also find total copper losses.

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7. A choke coil having a resistance of 10 ohm and inductance of 0.05 H is connected in series with a condenser of 100 μF. The whole circuit has been connected to 220 V, 50 Hz supply. Calculate:

(a) Impedance (b) current (c) power factor (d) power input (e) voltage across Resistance

8. Give the analogy between electric and magnetic circuit. A wrought iron bar 30 cm long and 2 cm in diameter is bent into a circular shape with 1 mm air gap. It is then wound with 500 turns of wire. Calcu;ate the current required to produce a flux of 0.5 m Wb, μr (iron) = 4000.

9. Describe the concept of parallel resonance with relevant characteristic curves. Derive the relations for impedance, current and resonant frequency.

Section-C

Attempt **any two** question of the following: **(15×2=30)**

10. (a) A 4-people dc shunt motor working on 220 V dc supply takes a line current of 3 A at no load while running at 1500 rpm. Determine the speed when the motor takes a line current of 50A. Assume the armature and field resistances as 0.2 ohm and 400 ohm respectively.

(b) Derive the generated e.m.f. equation for an alternator.

(c) Explain any one method for the starting of single phase induction motor. How the direction of rotation of motor can be reversed?

11. (a) Moving Coil Instrument gives a full scale deflection of 20 mA when a potential difference of 50 mV is applied. Calculate the Value of Resistance to be Connected in Parallel to measure current upto 50 A.

(b) In a two wattmeter method, total power measured was 30 kW at 0.7 pf lagging. Find the readings of each wattmeter.

(c) What is Grid? What are the various advantages of an interconnected power system?

12. (a) An inductive coil of resistance 10 ohm and inductance 0.1 H is connected in parallel with a 150 μF capacitor to a variable frequency 200 V supply. Find the frequency at which the total current taken from the supply is in phase with the supply voltage. Also find the magnitude of this current.

(b) Explain the construction and working principle of PMMC type of instruments with neat and clean diagram.

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(c) Calculate the current in R_3 by using Nodal analysis in fig-2.

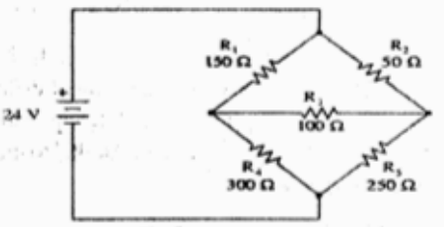

Fig-2

—x—

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