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

PAPER ID : 2018 Roll No. | | | | | | | | | | |

B. Tech.

FIRST SEMESTER EXAMINATION, 2006-07

ELECTRICAL ENGINEERING

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt ALL questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

(iv) Be precise in your answer.

1. Attempt *any four* parts of the following : **(5x4=20)**

(a) An alternating voltage is given by $v = 141.4 \sin 314t$. Find

(i) frequency

(ii) r.m.s. value

(iii) average value

(iv) the instantaneous value of voltage when 't' is 3 m sec.

(v) the time taken for the voltage to reach 100V for the first time after passing through zero value.

(f) A circular ring 20cm in diameter has an air gap 1mm wide cut in it. The area of cross-section of the ring is 3.6 cm^2. Calculate the value of the direct current needed in a coil of 1000 turns uniformly wound round the ring to create a flux of 0.5mWb in the air gap. Neglect fringing and assume relative permeability for the iron as 650.

2. Attempt *any four* parts of the following : **(5x4=20)**

(a) State and explain superposition theorem. Mention its limitations.

(b) Using Thevenin's theorem, determine current and voltage in 2ohm resistance in the circuit shown in figure 2.1.

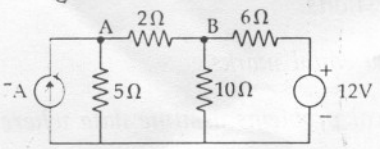

Fig.2.1

(c) Calculate currents in all the resistances of the circuit shown in figure 2.2 using node analysis method.

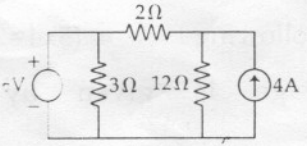

Fig.2.2

(d) Using delta to star transformation determine the resistance between terminals a-b and the total power drawn from the supply in the circuit shown in figure 2.3.

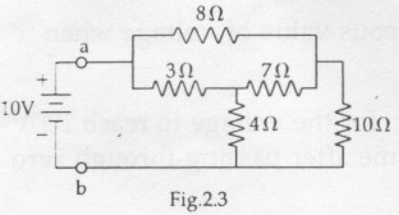

Fig.2.3

(e) Explain construction and principle of operation of dynamometer instrument. Why is this instrument suitable for both dc and ac measurements ?

(f) Why shunt is usually used in voltmeter and ammeter ?

A moving coil instrument has a resistance of 5 ohm and gives a full scale deflection of 100mV. Show how the instrument may be used to measure :

(i) voltages upto 50V

(ii) currents upto 10A.

Attempt *any two* parts of the following : **(10x2=20)**

(a) Derive the relationship between the line and phase voltages of an alternator.

Three similar coils each having a resistance of 8 ohm and an inductance of 0.0191 H in series in each phase is connected across a 400V, three phase, 50Hz supply. Calculate the line current, power input, kVA and kVAR taken by the load.

(b) Draw exact equivalent circuit and corresponding phasor diagram of a single phase transformer on load and explain them. Why no load current is kept small and how it is reduced ?

(c) List various losses occurring in a transformer and mention the condition for the maximum efficiency.

In a 25 kVA, 2000V/200V transformer the iron and copper losses are 200W and 400W respectively. Calculate the efficiency at half load and 0.8 power factor lagging. Determine also the maximum efficiency and the corresponding load.

(iii) rotor copper losses

(iv) mechanical power developed

(v) output power

(vi) output torque.

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(b) A single phase sinusoidal ac voltage supply is fed to a series R-C circuit. Determine

(i) the instantaneous expression of current flowing in the circuit

(ii) the impedance

(iii) the power factor

(iv) the power consumed

(v) the reactive volt-ampere.

(c) The parallel circuit shown in figure 1.1 is connected across a single phase 100V, 50Hz ac supply. Calculate :

(i) the branch currents

(ii) the total current

(iii) the supply power factor

(iv) the active and reactive power supplied by the supply.

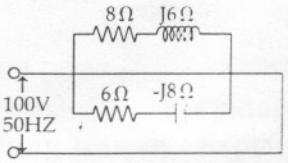

Fig.1.1

(d) Derive an expression for parallel resonance and mention its salient features.

(e) A 10mH coil is connected in series with a loss free capacitor to a variable frequency source of 20V. The current in the circuit has maximum value of 0.2A at a frequency of 100kHz. Calculate :

(i) the value of capacitance

(ii) the Q factor of the coil

(iii) the half power frequencies.

Attempt *any two* parts of the following : (10x2=20)

(a) Draw magnetization characteristics of a dc shunt generator and explain process of building up an e.m.f. Under what conditions the generator does not develop induced e.m.f. Suggest a remedy for each case.

(b) Three phase induction motor is self starting but three phase synchronous motor is not self starting. Explain why ? Give applications of three phase synchronous motor.

(c) A 4-pole dc shunt generator with wave wound armature has 40 slots each having 12 conductors. Armature resistance is 1 ohm and shunt field resistance is 200 ohm. The flux per pole is 25 mwb. If a load of 50 ohm is connected across the armature terminals, calculate the voltage across the load when the generator is driven at 1000 r.p.m. What will be the load voltage if the generator is lap wound ?

Attempt *any two* parts of the following : (10x2=20)

(a) Discuss why single phase induction motors do not have starting torque. Explain its principle of operation and list various methods of starting.

(b) Discuss why starters are necessary for three phase induction motors. Explain with diagram the working of Star-Delta starter.

(c) The power input to the rotor of a 440V, 50Hz, 3-phase, 6-pole induction motor is 50kW. The rotor e.m.f. makes 120 cycles per minute. Friction and windage losses are 2kW. Calculate :

(i) slip

(ii) rotor speed