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

PAPER ID : 199235 Roll No.

B.Tech.

(SEM. II) THEORY EXAMINATION 2013-14

ELECTRICAL ENGINEERING

Time : 3 Hours   *Total Marks : 100*

Note :– Attempt **all** Sections. Assume missing data if any.

SECTION-A

1. Answer **all** parts of this Section :   **(2×10=20)**

    (a) State the Superposition and Norton's theorem _____.

    (b) A sinusoidal current having rms value of _____ is to another sinusoidal current of rms value of _____. The rms value of resultant current is _____

    (c) Which of the following condition is common to both series and parallel resonance ?

      (i)   Current is maximum

      (ii) Power is low

      (iii) Impedance is minimum

      (iv) P.F. is unity

    (d) Enlist the type of moving iron instrument.

    (e) Which of the following formula is used to express active power in balanced 3-ϕ circuit :

      (i) $V_L I_L \cos\phi$

(ii) $\sqrt{3}V_L I_L \cos\phi$

(iii) $V_{Ph} I_{Ph} \cos\phi$

(iv) $\sqrt{3} V_{Ph} I_{Ph} \cos\phi$:

(f)   If the frequency of the excitation mmf is 'f'. The hysteresis loss and eddy current loss is propotional to _____ respectively.

(g)   Draw and explain hysteresis loop.

(h)   A 3-ϕ induction motor has 4-pole runs at 4% slip and full load. If speed of the motor is 720 rpm, the supply frequency is _____.

(i)   In armature winding of a 4-pole, lap wound DC machine having 760 active conductors and running at 1200 rpm with 20 mwb flux per pole, the induced voltage will be

_____

(j)   Match the following :

Type of motor	Application
DC series motor	Centrifugal pumps
Synchronous motor	Cranes
3-ϕ Squirrel cage IM	Hair dryer
1-f Shaded pole motor	Condense

SECTION–B

2.   Answer any **four** parts of this Section :   (10×4=40)

(a)   Using superposition theorem, calculate the current in the AB branch in the circuit shown in below figure :
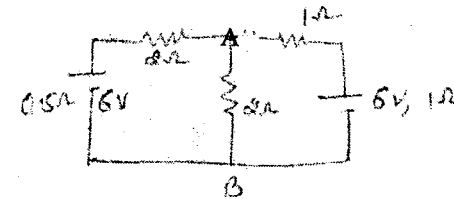
(b)   1.   An alternating voltage is V = 100 sin 100 t ; find :

(i)   Amplitude

(ii)   Time period and frequency

(iii)   Angular velocity

(iv)   Form factor

(v)   Crest factor.

2.   Refer to the circuit shown in the following figure find :

(i)   rms line current

(ii)   power dissipiated
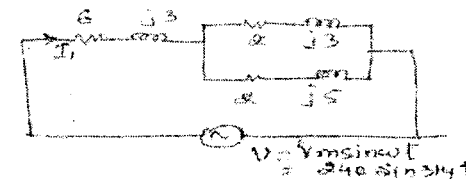
(iii)   power factor.

(c)   Explain two wattmeter method of determine power in 3-ϕ system. Discuss the variation in readings for different power factor of load from unit to zero.

(d) Explain construction and working principle of the following :

   (i) I-ϕ induction type energy meter

   (ii) PMMC type measuring instrument.

(e) 1. Draw single line diagram of a power system generating station and user. Mention the different voltage levels.

   2. Describe the analogies that can be made between electric and magnetic circuit.

(f) The ohmic values of the circuit parameters of a transformer having a turn ratio of 5, are $R_1 = 0.5$ ohm, $R_2 = 0.021$ ohm, $X_1 = 3.2$ ohm, $X_2 = 0.12$ ohm, $R_0 = 350$ ohm, referred to the primary and $X_m = 98$ ohm referred to the primary. Draw the approximate equivalent circuits of the transformer referred to secondary. Show the numerial values of the circuit parameters.

SECTION–C

3. Answer any **four** parts of this Section : (10×4=40)

(a) Determine the current I_x and I_y in the following network. State theorem used.

(b) 1. A balance delta-connected load of impedance $16 + j\ 12$ / phase is connected to a 3-ϕ 400 V supply. Find the phase current, line current, power factor, power, reactive VA, total VA.

   2. A moving coil milli-ammeter having a resistance of 8 ohm gives full scale deflection when a current of 5 mA is passed through it, explain how this instrument can be used for measurement of

      (i) Current upto 2A

      (ii) Voltage upto 8V.

(c) A DC shunt generator delivers 50 kW at 250 V when running at 500 rpm. The armature and field resistance are 0.05 ohm and 125 ohm respectively. Calculate the speed of the same machine and developed torque when running as a shunt motor and taking 50 kW at 250 V. Allow I volt per bursh for contact drop.

(d) Explain the various methods of starting of a 1-ϕ induction motor.

(e) Explain the following characteristics of a DC shunt motors :

   (i)   Speed – armature current

   (ii) Torque – armature current

   (iii) Speed – torque.

(f) Define slip in 3-ϕ induction motor. What is its value at staring and at the synchronous speed ? Draw torque-slip characteristics of 3-ϕ induction motor.