

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, choosing at least two from each part.

PART - A

- 1 a. Choose the correct answers for the following : (04 Marks)
- In DC series circuit, the supply voltage is _____ sum of voltage drop across each resistor.
 A) Arithmetic B) Algebraic C) Vector D) None of these
 - The equivalent resistance of two branch parallel circuit will be,
 A) More than largest resistance B) Lesser than the lowest resistance
 C) Equal to largest resistance D) Equal to lowest resistance
 - According to _____ law, the induced EMF opposes the cause producing it.
 A) Ohm's B) Faraday's C) Lenz's D) Kirchhoff's
 - Stationary induced EMF can be found in _____,
 A) Generator B) Transformer
 C) Both in generator and Transformer D) None of these
- b. For the circuit shown in Fig. Q1 (b), find the current in all the branches. (06 Marks)

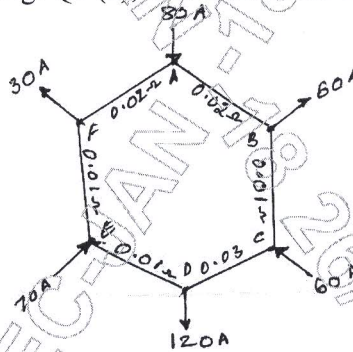


Fig. Q1 (b)

- State and explain Faraday's law of electro-magnetic induction. (05 Marks)
 - A coil consists of 750 turns. A current of 10 A in the coil gives rise to a magnetic flux of 1.2 mwb. Determine the inductance of the coil and the average induced EMF in the coil when this current is reversed in 10 ms. Also find the energy stored in inductance. (05 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- The power consumed by pure inductive circuit is,
 A) Unity B) Zero C) Infinity D) None of these
 - The peak value of a sine wave is 400VOH, its average value is _____
 A) 254.6 V B) 282.6 V C) 400 V D) 565.5 V
 - As the power factor increases, phase angle _____,
 A) Increases B) Decreases C) Remain's some D) None of these
 - The reciprocal of reactance is _____,
 A) Admittance B) Conductance C) Impedance D) Suceptance
- b. Show that power consumed in pure capacitive circuit is zero. (06 Marks)
- c. A coil of power factor 0.6 is in series with a 100 μ F capacitance when connected to a 50 Hz supply, the potential difference across the coil is equal to the potential difference across the capacitor. Find resistance inductance of the coil. (06 Marks)
- d. Two impedances $(20 + i15)$ and $(30 - j20) \Omega$ are connected in parallel. Find the branch currents if the total supply current is $10 \angle -30^\circ \text{ A}$. (04 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- The algebraic sum of all the phase voltages at any instant in a 3- ϕ balanced system is always _____.
A) zero B) one C) infinity D) $\sqrt{3}$
 - A 3 ϕ balanced load draws _____ times as much power when connected in Delt a, as it would draw when connected in star.
A) one B) two C) three D) four
 - A balance star connected load of $(8+j6) \Omega$ per phase is connected to a 3 ϕ , 230 V supply. The phase current is _____.
A) 13.279 A B) 10 A C) 25 A D) 23 A
 - In the measurement of 3 ϕ power by two watt meter method, if one of the wattmeter reads zero, then the power factor of the circuit is _____.
A) zero B) one C) between 0 and 0.5 D) 0.5
- b. Show that in a star connected 3 ϕ system, the line voltage is $\sqrt{3}$ times the phase voltage. (05 Marks)
- c. A 3- ϕ star connected with a phase voltage of 230 V is supplying a balanced Delta connected load. The load draws 15 kW at 0.8 pf lagging. Determine circuit constants. (06 Marks)
- d. During the measurement of power by two wattmeter method, the total input power at a 3 ϕ , 440V, motor running at a p.f of 0.8, was found to be 25 kw. Find the readings of the two wattmeters. (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- A fuse is a _____.
A) Power limiting device B) Voltage limiting device
C) Current limiting device D) Protective device.
 - One unit of electrical energy is equivalent to _____.
A) 100 wh B) 10 kwh C) 1 kwh D) 3600 w-sec
 - In a dynamometer wattmeter the fixed coil is _____.
A) Potential coil B) Current coil C) Both Current & Potential coil D) None of these
 - In energy meter, constant speed of rotation of disc is provided by _____.
A) Shunt magnet B) Series magnet C) Braking magnet D) None of these
- b. Explain the construction & working of single phase induction type energy meter. (08 Marks)
- c. Explain the plate earthing. (04 Marks)
- d. In brief, explain the factor affecting the selection of wiring. (04 Marks)

PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- the generator works on the principle of _____.
A) Statically induced EMF B) Mutual induced EMF
C) Dynamically induced EMF D) Kirchhoff's law
 - The brushes in DC generator are made up of _____.
A) Copper B) Carbon C) Iron D) Steel
 - DC series motor should always be started with load because _____.
A) At no load, speed is very high B) It cannot start without load
C) At no load, it draws a very small current
D) At no load, it develop high starting torque
 - In a 240V, DC motor, the back EMF is 220V & $R_a=0.5\Omega$ then its armature current is _____.
A) 10 A B) 20 A C) 30 A D) 40 A

- b. Derive an expression for armature and shaft torque. (06 Marks)
- c. DC shunt generator supplying a load of 5 kW at a voltage of 250 V. If it has armature resistance of 0.22Ω and shunt field resistance of 100Ω . Calculate generated EMF. (04 Marks)
- d. A 230 V, DC shunt motor takes a no load current of 3 A and runs at 1100 rpm. If the full load current is 41 A, find the speed on full load. Take $R_a = 0.25 \Omega$ and $R_{sh} = 230 \Omega$. (06 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- An ideal transformer does not change _____.
A) Voltage B) Power C) Current D) None of these
 - The average EMF/turn in a single phase transformer is _____.
A) $4 f \phi_m$ B) $4.44 f \phi_m$ C) $2 f \phi_m$ D) $f \phi_m$
 - The losses which vary with load in a transformer are _____.
A) Iron losses B) Copper losses C) Hysteresis loss D) Friction losses
 - For a 250 / 25 V, transformer having 10 KVA rating, the full load primary current is _____.
A) 0.4 A B) 4 A C) 40 A D) 400 A
- b. Derive an expression for induced EMF in 1- ϕ transformer. (06 Marks)
- c. A 1- ϕ transformer working at 0.8 pf has a efficiency of 94% at both full load and $\frac{3}{4}$ full load. Determine the efficiency at Half full load and unity power factor. (06 Marks)
- d. A 50 KVA, 1- ϕ transformer has 600 turns on primary and 40 turns on secondary. The primary winding is connected to the 2200 kV, 50 Hz supply. Calculate
(i) Secondary voltage on no load.
(ii) Full load primary and secondary current. (04 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- In an alternator _____ is a rotating part.
A) Armature B) Field C) Both armature and field D) None of these
 - The rated voltage of alternator used in power station is usually _____.
A) 11 kV B) 110 kV C) 220 kV D) 440 kV
 - The cylindrical pole field is used for _____ alternator,
A) low speed B) medium speed C) high speed D) none of these
 - The number of cycles generated in a 6 pole alternator in one revolution is _____.
A) 1 B) 2 C) 3 D) 4
- b. Derive an expression for induced EMF/ph in a 3 ϕ alternator. (06 Marks)
- c. What are the advantages of rotating field system? (04 Marks)
- d. A 6 pole, 3- ϕ , star connected alternator has a armature with 72 slots and 15 conductors / slot. It rotates at a speed of 1000 rpm, the flux per pole being 50 mwb, calculate the line value of EMF generated, if the $K_d = 0.966$ and $K_c = 0.97$ (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- An 3- ϕ induction motor works with _____ only.
A) DC B) AC C) Both AC and DC D) None of these
 - The frame of induction motor is made of _____.
A) Silicon steel B) Aluminium C) Bronze D) Cast iron
 - The magnitude of rotating magnetic field is _____.
A) $\frac{3}{2}$ times B) $\sqrt{3}$ times C) $\frac{1}{\sqrt{3}}$ times D) $\frac{2}{3}$ times
 - In squirrel cage rotor, the slots are skewed because _____.
A) To reduce losses B) To give support
C) To reduce magnetic hum D) To reduce friction

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- b. With neat sketch, explain the construction of 3 ϕ induction motor. (06 Marks)
- c. Explain the working of 3 ϕ induction motor. (05 Marks)
- d. A 3 ϕ induction motor has 6 poles and runs at 960 rpm on full load. It is supplied from a alternator having 4 poles and running at 1500 rpm. Calculate the full load slip and frequency of rotor emf. (05 Marks)

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