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NEW SCHEME

I/II Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Common to All Branches
Basic Electrical Engineering

Time: 3 hrs.] [Max. Marks:100

Note : ***Answer any FIVE full questions choosing at least TWO full questions from each part.***

Part A

1 a. Define RMS value of an alternating quantity. Obtain an expression for it in terms of maximum value. **(06 Marks)**

b. Given v = 200 sin 377t volts and i = 8 sin (377t – 30^0) amps for an a.c. circuit, determine :
   i) Power factor
   ii) True power
   iii) Apparent power
   iv) Reactive power

   Indicate the unit of power calculated. **(08 Marks)**

c. A circuit consists of resistance 10 Ω, an inductance of 16 mH and a capacitance of 150 μF connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. **(06 Marks)**

2 a. For the current wave shown in Fig.2(a)

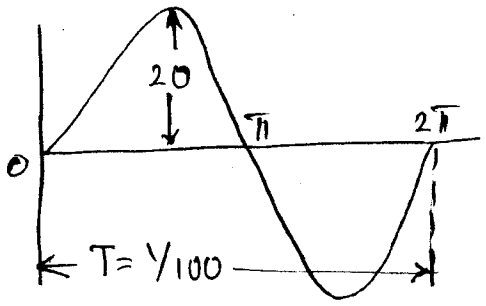
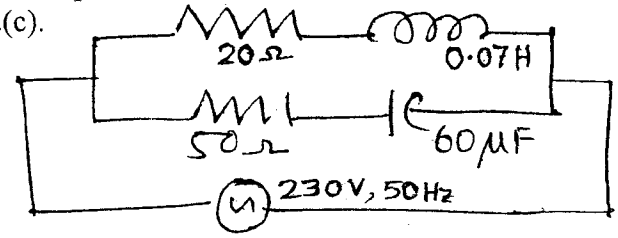


Fig 2(a)

Find
   i) Peak current
   ii) Average value
   iii) Frequency
   iv) Periodic time
   v) Instantaneous value at t = 3 ms. **(06 Marks)**

b. For a R-L-C series circuit, discuss the nature of power-factor for
   i) $X_L > X_C$ ii) $X_L < X_C$ iii) $X_L = X_C$ **(06 Marks)**

c. A circuit having a resistance 20 Ω and inductance of 0.07 H is connected in parallel with a series combination of 50 Ω resistance and 60 μF capacitance. Calculate the total current, when the parallel combination is connected across 230 V, 50 Hz, supply as shown in Fig.2(c).



(08 Marks)

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I·I$_2$

3 a. Explain generation of 3-ϕ voltages in an alternator. (04 Marks)
b. Define balanced load and phase sequence. (04 Marks)
c. Three similar choking coils each having resistance 10 Ω and reactance 10 Ω are connected in star across a 440 V, 3 phase supply. Find line current and reading of each of two wattmeters connected to measure power. (12 Marks)

4 a. Explain with neat sketch construction and principle of operation of "Dynamometer type wattmeter". (10 Marks)
b. What is the necessity of earthing? Explain any one type of earthing. (06 Marks)
c. What is fuse? Why is it used in electric circuits? (04 Marks)

Part B

5 a. Explain the different characteristics of a DC shunt motor. (08 Marks)
b. Why starter is needed? Explain 3-point starter used for DC motors. (07 Marks)
c. A separately excited DC generator when running at 1000 rpm supplies 50 A at 250 V. Find how much current it will deliver when the speed falls to 800 rpm. Take armature resistance as 0.01 Ω and brush drop of 1 V/brush. (05 Marks)

6 a. In a transformer the iron loss is the constant loss and copper loss is the variable loss. Justify. How are they minimized? (06 Marks)
b. A 40 kVA single phase transformer has core loss of 450 W and full load copper loss of 850 W. If the power factor of the load is 0.8 calculate :
i) Full load efficiency
ii) Maximum efficiency at upf
iii) Load for maximum efficiency. (08 Marks)
c. Explain the operation of transformer giving its no load vector diagram. (06 Marks)

7 a. Explain why a.c. generators are also called as synchronous generators. (04 Marks)
b. Enumerate the advantages of having stationary armature and rotating field system in large size alternator. (06 Marks)
c. A 4 pole, 1500 rpm, star connected alternator has 9 slots/pole and 8 conductors per slot. Determine the flux per pole to give a terminal voltage of 3300 V. Take the winding factor as unity. (10 Marks)

8 a. Explain the concept of rotating magnetic field in an induction motor. (08 Marks)
b. Explain why an induction motor draws high current during starting. (06 Marks)
c. A 12 pole, 3 phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor, which has a full load speed of 1440 rpm. Find the percentage slip and the number of poles of the motor. (06 Marks)

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iii) The flux in transformer core
A) Increases with load B) Decreases with load
C) Remains constant irrespective of load D) None of the above.

iv) The copper loss of certain transformer at half-full load is measured as 200W. Then the copper loss at full load will be
A) 100 W B) 200 W C) 400 W D) 800 W. **(04 Marks)**

b. What are the losses in a transformer? On what factors do they depend? And how are they minimized? **(05 Marks)**

c. How is efficiency of transformer pre-determined? Obtain the condition for maximum efficiency. **(05 Marks)**

d. A 25 KVA transformer has an efficiency of 94% at full load unity p.f and at half full load, 0.9 p.f. Determine the Iron loss and full load copper loss. **(06 Marks)**

7 a. i) An induction motor works with
A) d.c only B) a.c only C) Both a.c and d.c D) None of he above.

ii) The slip of an induction motor at stand still is
A) Zero B) One C) Infinity D) None of the above.

iii) A 4 pole, 50 Hz induction motor runs at a speed of 1440 rpm. The frequency of the rotor induced emf is
A) 3 HZ B) 2.5 Hz C) 2 Hz D) 1 Hz.

iv) An induction motor under full load has a slip of about
A) 0.03 B) 0.1 C) 0.3 D) Zero. **(04 Marks)**

b. Explain the principle of operation of a 3 phase induction motor and give reason for "An induction motor cannot run at synchronous speed" **(06 Marks)**

c. Define slip. Derive expression for frequency of rotor current. **(05 Marks)**

d. A 6 pole alternator runs at 1000 rpm supplies power to a 4 pole induction motor. The frequency of rotor of IM is 2 Hz. Determine the slip and speed of the motor. **(05Marks)**

8 a. i) A 4 pole, 1200 rpm alternator generates emf at a frequency of
A) 25 Hz B) 40 Hz C) 50 Hz D) 60 Hz

ii) The rated voltage of alternators used is power station is usually
A) 440 kV B) 220 kV C) 110 kV D) 11 kV

iii) Usually modern alternators have short pitched windings so as to
A) Increase the machine rating B) Improve the voltage wave form
C) Improve generated voltage D) None of these

iv) A salient pole field construction is used for alternator having
A) Low and Medium speed B) Large speed
C) Very large speed D) None of these. **(04 Marks)**

b. Explain the construction of cylindrical pole alternator. **(06 Marks)**

c. Obtain expression for emf of an alternator and explain the significance of winding factor. **(06 Marks)**

d. A 12 pole, 500 rpm, star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 Wh and is distributed sinusoidally. The winding factor is 0.97. Calculate the line emf. **(04 Marks)**

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II - I

06ELE15/25

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First / Second Semester B.E. Degree Examination, July 2007
Common to All Branches
Basic Electrical Engineering

Time: 3 hrs.] [Max. Marks:100

Note : ***Answer any FIVE full questions choosing atleast two full question from each part.***

PART A

1 a. State and explain Kirchoff's laws. **(06 Marks)**

b. A circuit consists of two parallel resistors having resistance of 20 Ω and 30 Ω respectively connected in series with 15 Ω. If current through 15 Ω resistor is 3 A, Find: i) Current in 20 Ω and 30 Ω resistors ii) The voltage across the whole circuit iii) The total power and power consumed in all resistances. **(08 Marks)**

c. State and explain Faraday's laws of electromagnetic induction. **(06 Marks)**

2 a. Define the following terms as applied to AC circuits and write expressions to each of them interms of 'R' and 'X' if the impedance Z = R + jX
i) Conductance ii) Susceptance iii) Power factor. **(06 Marks)**

b. A series RLC circuit is connected across a 50 Hz supply R = 100 Ω, L = 159.16 mH and C = 63.7 μF. If the voltage across 'C' is $150\angle -90^0$ V. Find the supply voltage. **(08 Marks)**

c. The circuit shown in fig.2(c) is operating at ω = 50 rad/sec. Construct two phasor diagrams one for 3 voltages and other for 3 currents. **(06 Marks)**

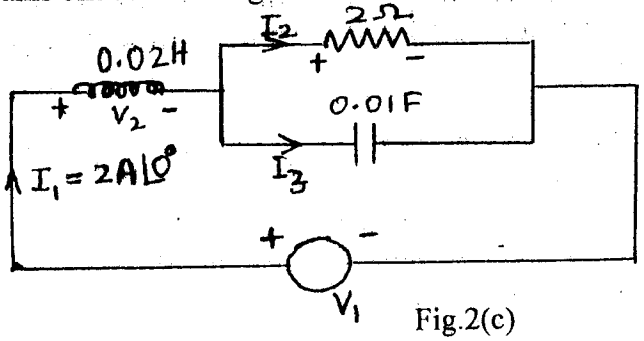

Fig.2(c)

3 a. Obtain the relationship between line voltages and phase voltages in a balanced 3-phase supply system. **(06 Marks)**

b. The power flowing in a 3Φ, 3-wire balanced load system is measured by two wattmeter method. The reading in Wattmeter A is 750 watts and wattmeter B is 1500 watts. What is the power factor of the system and load current per phase? **(08 Marks)**

c. Discuss the effect of variation of power factor on wattmeter readings. **(06 Marks)**

4 a. Describe with a circuit the method of controlling a lamp from 3 switches. **(06 Marks)**

b. Mention the factors on which the effects of electric shocks depend. What are the precautionary measures to be taken against electric shock? **(06 Marks)**

c. Sketch a single-phase induction type energy meter and name the parts. Explain how the damping torque is developed in it. **(08 Marks)**

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II - 12

PART B

5 a. What is back emf in a dc motor? What is its significance? **(06 Marks)**

b. Derive an expression for the armature torque developed in a dc motor. **(06 Marks)**

c. A 440 V dc shunt motor takes an armature current of 20 A and runs at 500 rpm. The armature resistance is 0.6 Ohms. If the flux is reduced by 40%, calculate the new values of armature current and speed. **(08 Marks)**

6 a. In what way does the core type transformer differ in construction from the shell type? With figures compare the magnetic circuits of the two. **(06 Marks)**

b. Mention the various power losses in a transformer and explain how they are minimized in practice. **(06 Marks)**

c. A 1 kW single-phase transformer has core loss of 15 watts and full load copper loss of 20 watts. Calculate the efficiency at

i) Full load, 0.9 P.F. lag

ii) Half full load unity P.F.

iii) ¾ full load, 0.707 P.F. lag/lead. **(08 Marks)**

7 a. With necessary sketches distinguish between salient pole and cylindrical pole type synchronous generation and when these are preferred. **(07 Marks)**

b. For an alternator find the different possible synchronous speeds for choice of poles from 2 to 10 for a frequency of 50 Hz. **(04 Marks)**

c. A 6 pole, 3Φ, star connected alternator has 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 50 mWb. Find the induced emf across its lines. Take the winding factor of 0.97. **(09 Marks)**

8 a. What is the principle of working of an induction motor? Explain the different types of an induction motor. Explain the different types of an induction motor. **(10 Marks)**

b. Define a slip. Derive expression for the slip and frequency of rotor current. **(06 Marks)**

c. An 8 pole alternator runs at 750 rpm supplies power to 4 pole induction motor. The frequency of rotor is 1.5 Hz. What is the speed of the motor? What is the slip? **(04 Marks)**

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06ELE15/25

First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions selecting atleast TWO questions from each PART.***

PART A

1 a. Explain Ohm's law and state its limitations. **(05 Marks)**

b. Define coefficient of coupling and establish a relation between self-inductance, mutual inductance with the coefficient of coupling. **(07 Marks)**

c. A current of 20 A flows through two ammeters A and B in series. The potential difference across A is 0.2 V and across B is 0.3 V. Find how the same current will divide between A and B when they are in parallel. **(08 Marks)**

2 a. Sketch the sinusoidal alternating current wave form and denote as well as define the following terms:
i) Instantaneous value
ii) Peak to peak value
iii) Peak amplitude. **(05 Marks)**

b. A series RLC circuit is composed of 100 ohms resistance, 1.0 H inductance and 5 μF capacitance. A voltage, V(t) = 141.4Cos377t volts is applied to the circuit. Determine the current and voltages V_R, V_L and V_C. **(07 Marks)**

c. An impedance coil in parallel with a 100 μF capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4 A and the power loss in the coil is 600 W. Calculate:
i) The resistance of the coil
ii) The inductance of the coil
iii) The power factor of the entire circuit. **(08 Marks)**

3 a. What is the necessity and advantages of three phase systems? **(05 Marks)**

b. Show that two wattmeters are sufficient to measure power in 3-phase balanced star connected circuits with the aid of neat circuit diagram and phasor diagrams. **(08 Marks)**

c. A three phase load of three equal impedances connected in delta across a balanced 400 V supply takes a line current of 10 A at a power factor of 0.7 lagging. Calculate from the first principles:
i) The phase current
ii) The total power
iii) The total reactive KVA.
If the windings are connected in star, what will be the new value of phase current and the total power? **(07 Marks)**

4 a. Describe the factors affecting the choice of a wiring system. **(05 Marks)**

b. With a neat connection diagram and switching table explain the TWO POINT CONTROL of a lamp. **(07 Marks)**

c. Explain construction and principle of operation of dynamometer type wattmeter with a neat sketch. **(08 Marks)**

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PART B

5 a. Explain the working principle of a DC machine as a generator and motor with suitable diagrams. **(06 Marks)**

b. Sketch N-I and T-I characteristics of DC i) Series and ii) Shunt motors. Mention two applications of each motor. **(06 Marks)**

c. A series motor runs at 600 rpm when taking 110 A from a 250 V supply. The resistance of the armature circuit is 0.12 Ω, and that of series winding is 0.03 Ω. The useful flux per pole for 120 A is 0.024 Wb, and that for 50 A is 0.0155 Wb. Calculate the speed when the current has fallen to 50 A. **(08 Marks)**

6 a. Derive an expression for the electromotive force induced in the secondary winding of a transformer. **(05 Marks)**

b. What are the losses in a transformer? On what factors do they depend? How they are minimized? **(06 Marks)**

c. A single phase 25 kVA 1000/2000 V, 50 Hz transformer has maximum efficiency of 98% at full load upf. Determine its efficiency at:
   i) ¾ full load upf
   ii) ½ full load 0.8 pF
   iii) 1.25 full load 0.9 pF. **(09 Marks)**

7 a. Enumerate the advantages of having stationary armature and rotating field system in large capacity synchronous generators. **(06 Marks)**

b. Explain the terms pitch factor, distribution factor and winding factor as applied to an alternator. **(06 Marks)**

c. A three phase, star connected synchronous generator driven at 900 r/min is required to generate a line voltage of 460 V at 60 Hz on open circuit. The stator has two slots per pole per phase, and 4 conductors per slot. Calculate:
   i) The number of poles
   ii) The useful flux per pole. **(08 Marks)**

8 a. With neat sketches explain the constructional details of squirrel cage and phase wound induction motors. **(08 Marks)**

b. Explain the significance of 'slip' in induction motors. **(06 Marks)**

c. If a six pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate:
   i) The percentage slip
   ii) The speed of the motor. **(06 Marks)**

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06ELE15/25

First / Second Semester B.E. Degree Examination, Dec.08/Jan.09
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note : *1. Answer any FIVE full questions, selecting at least two from each part.*
2. Answer all objective type questions only in first and second writing pages.
3. Answer for objective type questions shall not be repeated.

PART - A

1 a. i) If 100 V is applied across a 200 V, 100 W bulb, the power consumed will be,
A) 100 W B) 50 W C) 25 W D) 12.5 W

ii) Validity of Ohm's law requires that the
A) Voltage should remain constant B) Current should remain constant
C) Resistance must remain constant D) Power must remain constant.

iii) The direction of magnetic field produced by a linear current is given by
A) Ampere's law B) Flemings left hand rule
C) Right hand thumb rule D) None of the above.

iv) An emf of 7.2 volts is induced in a coil of 6mH. Then the rate of change of current is
A) 12 A/s B) 120 A/s C) 1200 A/s D) 12000 A/s. **(04 Marks)**

b. A 8 Ohm resistor is in series with a parallel combination of two resistors 12 ohm and 6 Ohm. If the current in the 6 Ohm resistor is 5A, determine the total power dissipated in the current. **(06 Marks)**

c. State and explain Kirchoff's laws. **(05 Marks)**

d. A coil consists of 600 turns and a current of 10 A in the coil gives rise to a magnetic flux of 1 milli Weber. Calculate i) Self inductance; ii) The emf induced and iii) The energy stored when the current is reversed in 0.01 second. **(05 Marks)**

2 a. i) A Sinusoidal voltage is represented as 141.42 Sin 314 $t_g t_s$. Rms value of voltage and frequency are respectively
A) 141.42 V, 314 Hz B) 100 V, 50Hz C) 200 V, 100 Hz D) 100 V, 100 Hz.

ii) Inductive reactance of a coil of inductance 0.5 H at 50 Hz is
A) 15.7 Ohm B) 157 Ohm C) 50 Ohm D) 25 Ohm.

iii) The power factor of pure resistive circuit is
A) Zero B) Unity C) Lagging D) Leading

iv) The impedence of A.C circuit is $50 \angle -60^\circ$ Ohm. Then the circuit is
A) Resistive B) Capacitive C) Inductive D) None of the above **(04 Marks)**

b. Obtain an expression for power in a series RLC circuit. **(08 Marks)**

c. A Parallel circuit comprises a resistor of 20 Ohm in series with an inductive reactance of 15 Ohm in one branch and a resistor of 30 Ohm in series with a capacitive reactance of 20 Ohm in the other branch. Determine the current and power dissipated in each branch if the total current drawn by the parallel circuit is $10 \angle -30^\circ$ Amp. **(08 Marks)**

3 a. i) In a three phase system, the emf's are:
A) 30° apart B) 60° apart C) 90° apart D) 120° apart.

ii) In the measurement of three-phase power by two wattmeter method, if the two wattmeter readings are equal, then the p.f of the circuit is
A) 0.8 lag B) 0.8 lead C) Zero D) Unity

iii) If V is the line voltage, I is the line current and ϕ is the angle between them, then the power P measured in a star three-phase load is equal to

A) 3 VI cos ϕ B) 3 VI sin ϕ C) $\sqrt{3}$ VI cos ϕ D) $\sqrt{3}$ VI sin ϕ.

iv) The algebraic sum of instantaneous phase currents in a three phase balanced system is

A) Zero B) Infinity C) Line Current D) Phase current. **(04 Marks)**

b. With relevant vector diagram, show that two wattmeters are sufficient to measure three phase power. **(08 Marks)**

c. Three similar coils each having resistance of 10 Ohm and reactance of 8 Ohms are connected in star across a 400 v, 3 phase supply. Determine the i) line current; ii) Total power and iii) Reading of each of two wattmeters connected to measure the power. **(08 Marks)**

4 a. i) Integrating meters are used for the measurement of

A) Current B) Voltage C) Power D) Energy

ii) A fuse is a

A) Protective device B) Current limiting device

C) Voltage limiting device D) Power limiting device.

iii) In a dynamometer wattmeter the fixed coil is

A) Current coil B) Potential coil

C) Current or potential coil D) None of the above.

iv) The average torque acting on the aluminium disc of an energymeter is proportional to the ----------consumed by the circuit

A) Current B) Voltage C) Power D) None of the above. **(04 Marks)**

b. Explain with a neat diagram the working of Dynamometer type wattmeter. **(08 Marks)**

c. Explain the necessity of Earthing. Explain pipe earthing with a neat diagram. **(08 Marks)**

PART - B

5 a. i) The emf generated by a given d.c generator depends upon

A) Flux only B) Speed only C) Flux and speed D) Terminal voltage

ii) Residual magnetism is necessary in a D.C

A) Shunt generator B) Seperately excited generator

C) Shunt motor D) Series motor

iii) A commutator is made up of

A) Iron lamination B) Copper segments

C) Both Iron lamination and copper segments D) None of the above.

iv) The back emf of a motor at the moment of starting is

A) Zero B) Maximum C) Low D) Optimum **(04 Marks)**

b. A 4 pole, 1500 rpm d.c generator has a lap wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 Wh, calculate the emf generated in the armature. What would be the generated emf if the winding is wave connected? **(06 Marks)**

c. Derive an expression for Torque in a D.C motor. **(04 Marks)**

d. The current drawn from the mains by a 220 V D.c shunt motor is 4 A on no-load. The resistance field and armature windings are 110 Ohms and 0.2 Ohm respectively. If the line current on full load is 40 A at a speed of 1500 RPM, find the no-load speed. **(06 Marks)**

6 a. i) The core of the transformer is laminated to reduce.

A) Eddy current loss B) Hysterisis loss C) Copper loss D) Friction loss.

ii) An ideal transformer does not change

A) Voltage B) Current C) Power D) None of the above

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06ELE15/25

First / Second Semester B.E. Degree Examination, June-July 2009
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note : 1. *Answer any Five full question, choosing at least two from each part.*
2. *Answer all objectives type questions only in OMR sheet page 5 of the Answer Booklet.*
3. *Answer to the objective type questions on sheets other than OMR will not be valued*

PART – A

1 a. i) A series circuit consists of 4.7KΩ, 5.6KΩ, 9KΩ and 10KΩ resistors, which resistor has the most voltage across it?_____
A) 4.7KΩ B) 5.6KΩ C) 9KΩ D) 10KΩ
ii) The power dissipation in each of three parallel branches is 1W. The total power dissipation of the circuit is _____
A) 1W B) 4W C) 3W D) 9W
iii) The direction of induced emf in a conductor can be deduced by _____
A) Fleming's Left Hand rule B) Fleming's Right Hand rule
C) Cork screw rule D) Lenz's law.
iv) The maximum value of coefficient of coupling is _____
A) 100% B) more than 100% C) 90% D) none of these **(04 Marks)**

b. Obtain the potential difference Vxy in the circuit of fig.Q1(b). **(06 Marks)**

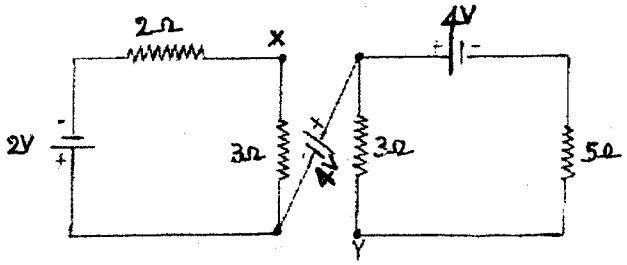

Fig.Q1(b)

c. Derive an expression for energy stored in the magnetic field. **(04 Marks)**

d. Define coefficient of coupling and establish relation between self inductance, mutual inductance with coefficient of coupling. **(06 Marks)**

2 a. i) The time period of a sinusoidal wave form with 200Hz frequency is _____
A) 0.05S B) 0.005S C) 0.0005S D) 0.5S
ii) The peak value of a sine wave is 400V, its average value is _____
A) 254.6V B) 282.6V C) 400V D) 565.5V
iii) In a certain RL circuit, $V_R = 2V$ and $V_L = 3V$. The magnitude of total voltage is _____
A) 2V B) 3V C) 5V D) 3.6V
iv) When the frequency of the applied voltage in series RC circuit is increased the capacitance reactance_____
A) increase B) decreases C) becomes zero D) remains same
(04 Marks)

b. Define i) form factor and ii) power factor in ac circuits. **(04 Marks)**

c. Obtain the form factor of full rectified sine wave. **(05 Marks)**

d. When 220V AC supply is applied across AB terminals in the circuit shown in fig.Q2(d), the total power input is 3.25KW and the current is 20amps. Find the current through Z_3. **(07 Marks)**

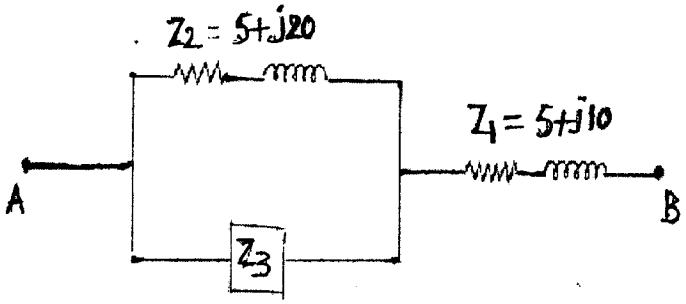

Fig.Q2(d)

3 a. i) In a balanced three phase load. the power factor of the three phases are _____

A) different B) same C) zero D) none of these.

ii) The power taken by a 3 – phase load is given by the expression _____

A) $3V_LI_L \cos\phi$ B) $\sqrt{3}\ V_LI_L \cos\phi$ C) $3V_LI_L \sin\phi$ D) $\sqrt{3}\ V_LI_L \sin\phi$

iii) In the 2 wattmeter method of measuring 3 – phase power, the two watt meters indicate equal and opposite readings when the load power factor angle is _____ degrees lagging.

A) 60 B) 0 C) 30 D) 90

iv) In delta connected system, the relation between the line current I_L and phase current I_{ph} is _____

A) $I_L = I_{ph}$ B) $I_L = I_{ph}/\sqrt{3}$ C) $I_L = \sqrt{3}\ I_{ph}$ D) $I_L = 3I_{ph}$. **(04 Marks)**

b. Obtain the relationship between the phase and line values of voltages and currents in a balanced star connected system. **(08 Marks)**

c. A balanced three phase star connected load draws power from 440V supply. The two watt meters connected indicate W_1 = 5KW and W_2 = 1.2KW. Calculate power, power factor and current in the circuit. **(08 Marks)**

4 a. i) A fuse is a _____

A) current limiting device B) protective device

C) voltage limiting device D) None of these.

ii) A good earthing should provide _____ resistance in earthing path.

A) low B) high C) medium D) none of these.

iii) In the energy meter, constant speed of rotation of disc is provided by _____

A) shunt magnet B) series magnet C) braking magnet D) none of these

iv) In the measuring instruments, under equilibrium condition, controlling torque (T_c) and deflecting torque (T_d) are _____

A) $T_c = T_d$ B) $T_c > T_d$ C) $T_c < T_d$ D) None of these. **(04 Marks)**

b. Explain with neat diagram working of induction type energy meter. **(08 Marks)**

c. Why earthing of electrical apparatus is required? Explain. **(04 Marks)**

d. What is the purpose of fuse? What are the requirements of good fuse? **(04 Marks)**

PART – B

5 a. i) The material for commutator brushes is always_____
A) mica B) copper C) cast iron D) carbon
ii) Which DC motor will be preferred for constant speed line shafting _____
A) cumulatively compound motor B) differentially compound motor
C) shunt motor D) series motor.
iii) For a 'P' pole lap wound armature of DC machine the number of parallel paths are equal to _____
A) 2 B) 2P C) P D) P/2.
iv) The relationship between the applied voltage and back emf in DC motors is _____
A) $V = E_b + I_aR_a$ B) $V = E_b - I_aR_a$ C) $V = E_b$ D) none of these.
(04 Marks)

b. Why starter is needed? With neat sketch, explain 3 – point starter used for DC motor. **(08 Marks)**

c. A DC series motor is running with a speed of 1000 rpm, while taking a curent of 22 amps from the supply. If the load is changed such that the current drawn by the motor is increased to 55amps, calculate the speed of the motor on new load. The armature and series winding resistances are 0.3Ω and 0.4Ω respectively. Assume supply voltage as 250V. **(08 Marks)**

6 a. i) Losses which donot occur in transformer are _____
A) copper losses B) magnetic losses C) friction losses D) none of these
ii) If Copper loss of a transformer at $1/4^{th}$ full load is 100W, then its full load copper loss would be _____
A) 100W B) 400W C) 800W D) 1600W.
iii) If an ammeter in the secondary of a 100/10V transformer reads 10A, the current in the primary would be _____
A) 1A B) 2A C) 10A D) 100A
iv) The no load primary current I_0 in transformer _____
A) is in phase with V_1 B) leads V_1 by 90^0 C) lags behind V_1 by 90^0
D) lags V_1 by an angle between 0^0 and 90^0. **(04 Marks)**

b. Explain with vector diagram the working principle of transformer on no – load. **(06 Marks)**

c. Define the voltage regulation of transformer; what is its importance? **(04 Marks)**

d. The primary winding of a transformer is connected to a 240V, 50Hz supply. The secondary winding has 1500 turns. If the maximum value of the core flux is 0.00207 Wb, determine i) the secondary induced emf ii) number of turns in the primary iii) cross sectional area of core if the flux density has maximum value of 0.465 Tesla. **(06 Marks)**

7 a. i) The field winding of an alternator is excited by _____
A) dc B) ac C) both dc and ac D) none of these.
ii) For full pitch coil, the pitch factor K_p is_____
A) 1 B) greater than 1 C) less than 1 D) none of these.
iii) The number of cycles generated in a 6-pole alternator in one revolution is _____
A) 3 B) 6 C) 50 D) none of these.
iv) The non salient pole field construction is used for _____ alternator.
A) low speed B) medium speed C) high speed D) none of these.
(04 Marks)

b. Enumerate the advantages of having stationary armature and rotating field system in large size alternator. **(08 Marks)**

c. A 3 – phase, 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux per pole 24.8m Wb is sinusoidally distributed, the coils are full pitched. Find i) speed and ii) the line emf. Assume winding factor $K_d = 0.96$.
(08 Marks)

8 a. i) The relation between rotor frequency (f ′) and stator frequency (f) is given by _____

A) $f' = sf$ B) $f' = f / s$ C) $f' = \sqrt{sf}$ D) $f' = (1 - s) f$.

ii) Synchronous speed of three phase induction motor is given by _____

A) $N_s = 120\ fP$ B) $N_s = 120\ f/p$ C) $N_s = 120\ p/f$ D) $N_s = fp/120$

iii) The frame of induction motor is usually made of _____

A) silicon steel B) cast iron C) alluminium D) bronze

iv) A 4 pole, 440V, 50Hz induction motor is running at a slip 4%. The speed of motor is _____

A) 1260 rpm B) 1440 rpm C) 1500 rpm D) 1560 rpm. **(04 Marks)**

b. What is 'slip' in an induction motor? Explain why slip is never zero in an induction motor. **(06 Marks)**

c. What are the applications of 3 – phase induction motors? **(04 Marks)**

d. If the electromotive force in the stator of an 8 – pole induction motor has a frequency of 50Hz and that in the rotor 1.5Hz, at what speed is the motor running and what is the slip? **(06 Marks)**

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06ELE15/25

First/Second Semester B.E. Degree Examination, Dec.09/Jan.10

Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing at least two from each part.*
2. Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.
3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1 a. Choose the correct answers :

i) The resistance of a 200 W, 250 V lamp is _____.
A) 625 Ω B) 1250 Ω
C) 312.5 Ω D) 31.25 Ω

ii) The voltage applied across an electric iron is halved. The power consumption of the iron reduces to _____.
A) One half B) Three fourth
C) One fourth D) 0.707 times.

iii) The practical unit of electrical energy is _____ .
A) KW-hr B) Watt-hr
C) Watt-second D) Joule-second

iv) Which of the following statements is true both for a series and a parallel circuit?
A) Resistances are additive B) Powers are additive
C) Currents are additive D) Voltage drops are additive. **(04 Marks)**

b. A resistance R is connected in series with a parallel circuit comprising of two resistances of 12 Ω and 8 Ω respectively. The total power dissipation in the circuit is 70 W when the applied voltage is 20 V. Calculate R. **(06 Marks)**

c. Explain dynamically and statically induced emfs. **(06 Marks)**

d. A coil consists of 750 turns. A current of 10 A in the coil gives rise to a magnetic flux of 1200 μwb. Determine the inductance of the coil and the average emf induced in the coil when this current is reversed in 0.01 second. **(04 Marks)**

2 a. Choose the correct answers :

i) A sinusoidal voltage varies from zero to maximum of 250 V. The voltage at the instant of 60° of the cycle will be _____ .
A) 150 V B) 216.5 V
C) 125 V D) 108.25 V

ii) In a purely resistive circuit, the average power P_{av} is _____ the peak power, P_{max}.
A) Double B) One-half of
C) One-fourth D) Equal to.

iii) An a.c voltage is given by V = 40 sin 314 t. The frequency is _____ .
A) 75 Hz B) 50 Hz
C) 25 Hz D) 100 Hz.

iv) In a pure capacitive circuit, the current
A) Lags behind the voltage by 90° B) Leads the voltage by 90°
C) Remains in phase with voltage D) None of these **(04 Marks)**

b. Prove that the current in a purely inductive circuit lags behind the applied voltage by 90°. **(08 Marks)**

2 c. Two circuits A and B are connected in parallel across 200 V, 50 Hz supply. Circuit A consists of 10 Ω resistance and 0.12 H inductance in series while circuit B consists of 20 Ω resistance in series with 40 μF capacitance. Calculate : i) Current in each branch ii) Supply current iii) Total power factor. Draw the phasor diagram. **(08 Marks)**

3 a. Choose the correct answers :

i) In a 3ϕ balanced star connected load, the neutral current is equal to :

A) Zero B) I_{phase}

C) I_{Line} D) Unpredictable

ii) The relationship between the line and phase voltage of a Δ - connected circuit is given by,

A) $V_L = V_P$ B) $V_L = \sqrt{3}V_P$

C) $V_L = V_P/\sqrt{2}$ D) $V_L = \frac{2}{\pi}V_P$

iii) W_1 and W_2 are the readings of two Wattmeters used to measure power of a 3ϕ balanced load. The active power drawn by the load is,

A) $W_1 + W_2$ B) $W_1 - W_2$

C) $\sqrt{3}(W_1 + W_2)$ D) $\sqrt{3}(W_1 - W_2)$

iv) In the measurement of 3ϕ power by two Wattmeters, if the two Wattmeter readings are equal, the power factor of the circuit is

A) 0.8 lagging B) 0.8 leading

C) Zero D) Unity **(04 Marks)**

b. Obtain the relationship between line currents and phase currents in a balanced 3ϕ delta connected system. **(06 Marks)**

c. Discuss the effect of the variation of power factor on Wattmeter readings. **(06 Marks)**

d. Three similar impedances are connected in delta across a 3ϕ supply. The two Wattmeters connected to measure the input power indicate 12 kW and 7 kW. Calculate :

i) Power input ii) Power factor of the load. **(04 Marks)**

4 a. Choose the correct answers :

i) An electrodynamometer type instrument can be employed for measurement of,

A) d.c voltages

B) a.c voltages

C) d.c as well as a.c voltages

D) d.c voltages but for a.c voltages, rectification is necessary

ii) In an energy meter, the moving system attains the steady speed when,

A) Braking torque is zero B) Braking torque is equal to operating torque

C) Braking torque is maximum D) Operating torque is constant.

iii) The material used for fuse wire should be of

A) Low resistivity and high melting point

B) High resistivity and high melting point

C) High resistivity and low melting point.

D) Low resistivity and low melting point.

iv) The earth wire should be

A) Good conductor of electricity

B) Mechanically strong

C) Both (a) and (b)

D) Mechanically strong but bad conductor of electricity. **(04 Marks)**

b. With a neat diagram, explain the working of an induction type of energymeter. **(08 Marks)**

c. With relevant circuit diagrams and switching tables, explain two-way and three-way control of lamps. **(08 Marks)**

PART – B

5 a. Choose the correct answers :

i) The nature of current flowing in the armature of a d.c. machine is
   A) a.c. B) d.c.
   C) Pulsating D) d.c. superimposed over a.c

ii) The components of a d.c generator which plays vital role in providing direct current is
   A) Dummy coils B) Equalizer rings
   C) Commutator D) Brushes

iii) The speed of a d.c shunt motor ____ from no load to full load.
   A) Falls slightly B) Improves slightly
   C) Remains unchanged D) Falls rapidly

iv) The function of a starter in a d.c motor is to
   A) Control its speed
   B) Increase its starting torque
   C) Limit the starting current to a safer value
   D) Reduce armature reaction effect. **(04 Marks)**

b. Derive an expression for the armature torque developed in a d.c motor. **(06 Marks)**

c. Sketch and explain : i) torque-armature current characteristics ii) Speed-armature current characteristics for a d.c shunt motor. **(04 Marks)**

d. A 200 V, 4 pole, lap wound, d.c shunt motor has 800 conductors on its armature. The resistance of the armature winding is 0.5 Ω and that of shunt field winding is 200 Ω. The motor takes a current of 21 A, the flux/pole is 30 mWb. Find the speed and gross torque developed in the motor. **(06 Marks)**

6 a. Choose the correct answers :

i) A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is
   A) 1 B) 100 C) 0.01 D) 0.1

ii) The losses which vary with load in a power transformer are
   A) Friction and windage losses B) Copper losses
   C) Eddy current losses D) Hysterisis losses

iii) The regulation of a transformer is defined as
   A) Rise in terminal voltage when loaded
   B) Fall in terminal voltage when loaded
   C) Change in secondary terminal voltage from no-load to full-load as a percentage of secondary no load terminal voltage.
   D) Change in flux from no-load to full-load.

iv) The copper loss of a certain transformer at half full load is measured as 200 W. Then the copper loss at full load is :
   A) 800 W B) 200 W C) 100 W D) 400 W . **(04 Marks)**

b. Explain the various losses that occur in a transformer. **(06 Marks)**

c. A 1ϕ transformer has 1000 turns on its primary and 400 turns on the secondary side. An a.c voltage of 1250 V, 50 Hz is applied to its primary side, with the secondary open circuited. Calculate : i) The secondary emf ii) Maximum value of flux density, given that the effective cross-sectional area of core is 60 cm^2. **(04 Marks)**

d. A 250 kVA, 1ϕ transformer has 98.135% efficiency at full load and 0.8 lagging p.f. The efficiency at half load and 0.8 lagging p.f is 97.751%. Calculate the iron loss and full-load copper loss. **(06 Marks)**

7 a. Choose the correct answers :

i) The frequency of emf generated by an alternator depends upon the alternator speed, N(rpm) and number of poles on the alternator, P and is given by

A) $\frac{PN}{60}$ B) $\frac{60N}{P}$ C) $\frac{PN}{120}$ D) $\frac{120N}{P}$

ii) The salient pole type rotors have

A) Smaller diameter B) Larger diameter
C) Smaller axial length D) Both (b) and (c)

iii) The most suitable rotor for a turbo-alternator designed to operate at high speed is

A) Salient pole type rotor B) Smooth cylindrical type rotor
C) Squirrel cage rotor D) Either of the above.

iv) The ratio of the phasor sum of the emfs induced in all the coils distributed in a number of slots under one pole to the arithmetic sum of the emfs induced is known as

A) Breadth or distribution factor B) Coil-span factor
C) Pitch factor D) Winding factor. **(04 Marks)**

b. With neat diagrams, explain the constructional features of a 3ϕ - alternator. **(08 Marks)**

c. A 3ϕ, 16 pole, Y-connected alternator has 144 slots on the armature periphery. Each slot contains 10 conductors. It is driven at 375 rpm. The line value of emf available across the terminals is observed to be 2.657 kV. Find the frequency of the induced emf and flux per pole. **(08 Marks)**

8 a. Choose the correct answers :

i) The rotor of a 3ϕ induction motor rotates in the same direction as that of stator rotating field. This can be explained by

A) Faraday's laws of electromagnetic induction.
B) Lenz's law.
C) Newton's law of motion
D) Flemming's right hand rule.

ii) A 3ϕ, 440 V, 50 Hz, induction motor has 4% slip. The frequency of rotor emf is

A) 200 Hz B) 50 Hz
C) 2 Hz D) 0.2 Hz

iii) If N_S is the synchronous speed and 's' is the slip, then actual running speed of an induction motor will be

A) N_S B) sN_S
C) $(1 - s)N_S$ D) $(N_S - 1)\, s$

iv) The number of poles in a 3ϕ induction motor is determined by the

A) Supply frequency B) Motor speed
C) Supply voltage D) Both (a) and (b) **(04 Marks)**

b. Explain the production of torque in a 3ϕ induction motor. **(04 Marks)**

c. Explain the terms pitch factor, distribution factor and winding factor as applied to an alternator. **(06 Marks)**

d. A 4 pole , 3ϕ, 50 Hz induction motor runs at a speed of 1470 rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this condition. **(06 Marks)**

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06ELE15/25

First/Second Semester B.E. Degree Examination, May/June 2010
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, choosing at least two questions from each part.***
2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1 a. Choose the correct answer from the following :

i) A wire of resistance R is stretched to double its length. The new resistance of the wire is _____.

A) $\frac{R}{2}$ B) 2R C) 4R D) $\frac{R}{4}$

ii) The Fig.Q1(a)(ii) shows a part of a closed electrical circuit. The potential drop between A and B is _____.

A) 18 V B) –18 V C) 4 V D) –4 V

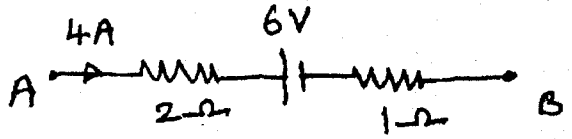

Fig.Q1(a)(ii)

iii) AT/m is the unit of _____

A) m.m.f. B) Reluctance
C) Magnetizing force D) Magnetic flux density.

iv) The e.m.f. induced in a coil of N turns is _____.

A) $N\frac{d\phi}{dt}$ B) $N\frac{d\phi}{di}$ C) $-N\frac{d\phi}{dt}$ D) $L\frac{d\phi}{di}$ **(04 Marks)**

b. The total power consumed by the network shown in Fig.Q1(b) is 16 w. Find the value of R and the total current. **(06 Marks)**

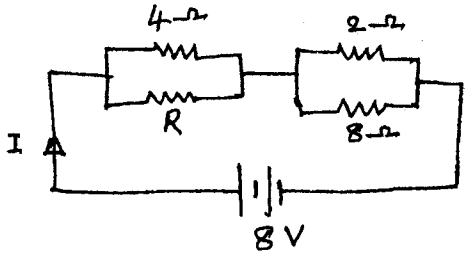

Fig.Q1(b)

c. Define the coefficient of coupling and find its relation with L_1, L_2 and M. **(04 Marks)**

d. Two identical coils of 1200 turns each, are placed side by side such that, 60% of the flux produced by one coil links the other. A current of 10 A in the first coil, sets up a flux of 0.12 mwb. If the current in the first coil changes from +10A to –10A in 20 msec, find:
i) The self inductance of the coils ii) The e.m.fs induced in both the coils. **(06 Marks)**

2 a. Choose the correct answer from the following :

i) An alternating voltage is given by V = 100 sin (314 t – 30°) volts. The frequency is _____.

A) 25 Hz B) 50 Hz C) 60 Hz D) 100 Hz

ii) The peak factor of a sinusoidally varying voltage is _____.

A) 1.414 B) 1.11 C) 0.866 D) 0.707

iii) The p.f. is lagging when _____.

A) Voltage lags the current B) Current lags the voltage

C) Voltage lags the power D) Current lags the power.

iv) The reactive power in a single phase a.c. circuit is given by _____.

A) EI cos ϕ B) EI sin ϕ C) EI D) None of these **(04 Marks)**

b. Show that a pure capacitance does not consume any power. Draw the waveforms of voltage, current and power, when alternating voltage is applied to the pure capacitance circuit. **(08 Marks)**

c. A coil of power factor 0.6 is in series with a 100 μF capacitor. When connected to a 50 Hz supply, the p.d. across the coil is equal to the p.d. across the capacitor. Find the resistance and inductance of the coil. **(08 Marks)**

3 a. Choose the correct answer from the following :

i) In a three phase balanced supply system, the sum of the instantaneous values of the three voltages at any instant is _____.

A) Maximum B) Zero C) Minimum D) None of these

ii) In a three phase balanced star system, the relation between the line voltage V_L and the phase voltage V_{ph} is _____.

A) $V_L = \frac{V_{ph}}{\sqrt{3}}$ B) $V_L = \sqrt{3}V_{ph}$ C) $V_L = V_{ph}$ D) None of these

iii) The voltage $V_{AB} = 50\angle 30^\circ$ volts. Then, V_{BA} is _____ volts.

A) $50\angle -180^\circ$ B) $50\angle -150^\circ$ C) $50\angle -30^\circ$ D) $50\angle -210^\circ$

iv) When the two wattmeters used to measure a three phase power, give equal readings, then the p.f. of the circuit is _____.

A) 0.5 B) 0 C) 0.866 D) 1 **(04 Marks)**

b. For a three phase star connection, find the relation between live and phase values of currents and voltages. Also derive the equation for the three phase power. **(05 Marks)**

c. Explain the effect of power factor on the two wattmeter readings connected to measure the three phase power. **(05 Marks)**

d. Three similar coils each having resistance of 10 Ω and reactance of 8 Ω are connected in star across a 400 V, 3 phase supply. Determine the:

i) Line current

ii) Total power and

iii) Reading of each of the two wattmeters connected to measure the power. **(06 Marks)**

4 a. Choose the correct answer from the following :

i) The dynamometer type wattmeter is used to measure _____.

A) Only D.C. power B) Only AC power

C) Both D.C. and A.C power D) Both active and reactive power

ii) The pointer in the dynamometer type wattmeter is made of _____.

A) Copper B) Aluminum C) Phosphor bronze D) Platinum

iii) One unit of electrical energy is equivalent to _____.

A) 1 KWH B) 3600 W-sec C) 100 WH D) 10 KWH

iv) In the energy meter, constant speed of rotation of the disc is provided by _____.

A) Shunt magnet B) Series magnet

C) Braking magnet D) None of these **(04 Marks)**

4 b. With a neat diagram, explain the working of 1-phase energy meter. **(08 Marks)**

c. Explain the necessity of earthing. Explain pipe earthing, with a neat diagram. **(08 Marks)**

PART – B

5 a. Choose the correct answer from the following :

i) The armature of a d.c. generator is laminated to reduce _____.

A) Eddy current loss B) Hysteresis loss

C) Friction loss D) Copper loss

ii) In a wave winding, the number of parallel paths is equal to _____.

A) $\frac{p}{2}$ B) 2 C) p D) 2p

iii) The d.c. motor equation is _____.

A) $V = E_b + I_aR_a$ B) $V = E_b - I_aR_a$ C) $E_b = I_aR_a - V$ D) None of these

iv) For the movement of a train d.c. _____ motors are used.

A) Shunt B) Series

C) Compound D) None of these **(04 Marks)**

b. With a neat sketch, explain the constructional features of a D.C. machine. Mention the functions of each part. **(08 Marks)**

c. A 440 V dc shunt motor takes an armature current of 20 A and runs at 500 rpm. The armature resistance is 0.6 ohm. If the flux is reduced by 30% and the torque is increased by 40%, calculate the new values of armature current and speed. **(08 Marks)**

6 a. Choose the correct answer from the following :

i) An ideal transformer does not change _____.

A) Voltage B) Current C) Power D) None of these

ii) In a step-up transformer _____ remains constant.

A) Voltage B) Current C) Power D) None of these

iii) Transformation ratio in a transformer is equal to

A) $\frac{E_1}{E_2}$ B) $\frac{N_1}{N_2}$ C) $\frac{N_2}{N_1}$ D) $\frac{I_2}{I_1}$

iv) A transformer has 200 W iron loss at full load. The iron loss at half full load is _____.

A) 100 W B) 200 W C) 400 W D) 300 W **(04 Marks)**

b. Explain the working principle of a transformer on load. **(04 Marks)**

c. What are the various losses that occur in a transformer? Give the equations for these losses. **(06 Marks)**

d. A 600 KVA transformer has an efficiency of 92% at full load and unity p.f. The p.f. is 0.9 at half load. Determine its efficiency at 75% of full load and 0.9 p.f. **(06 Marks)**

7 a. Choose the correct answer from the following :

i) A salient pole rotor is used in _____ alternators.

A) Low speed B) Medium speed C) High speed D) At all speeds

ii) The number of cycles of emf generated in a 4 pole alternator per revolution is _____.

A) 4 B) 2 C) 50 D) 100

iii) An 8 pole alternator runs at 600 rpm. The frequency of the induced emf is _____.

A) 40 Hz B) 50 Hz C) 60 Hz D) 70 Hz

iv) When an alternator is loaded, its terminal voltage _____.

A) Increases B) Decreases

C) Does not change D) None of these **(04 Marks)**

7 b. How are alternators classified? With neat figures, give the constructional difference between them. **(04 Marks)**

c. Obtain the expression for emf of an alternator and give the significance of the winding factor. **(06 Marks)**

d. A two pole, three phase alternator running at 3000 rpm has 42 armature slots with two conductors in each slot. Calculate the flux per pole, required to generate a live voltage of 2300 V. Distribution factor is 0.952 and the pitch factor is 0.956. **(06 Marks)**

8 a. Choose the correct answer from the following :

i) When a 3-ϕ supply is given to the stator of a 3-ϕ induction motor, a _____ magnetic field is produced.

A) Stationary B) Alternating C) Rotating D) None of these

ii) In a 3-ϕ induction motor, the slip speed is given by _____.

A) N_S B) N C) $N_S - N$ D) $N - N_S$

iii) A supply of 50 Hz is given to a 3-ϕ I.M having 4 poles. If the I.M runs at 1440 rpm, the slip is _____.

A) 3% B) 4% C) 5% D) 3.33%

iv) The air-gap between the stator and the rotor of a 3-ϕ I.M ranges from _____.

A) 2 cm to 4 cm B) 0.4 mm to 4 mm

C) 1 cm to 2 cm D) 4 cm to 6 cm **(04 Marks)**

b. What is slip in an induction? Explain why slip is never zero in an induction motor. **(06 Marks)**

c. Explain why an induction motor needs a starter. **(04 Marks)**

d. A 6 pole induction motor is supplied by a 10 pole alternator which is driven at 600 rpm. If the motor is running at 970 rpm, determine the percentage slip. **(06 Marks)**

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