1ˢᵗ Semester Back Examination 2017-18
Basic Electrical Engineering
BRANCH : AEIE, AUTO, CHEM, CIVIL, CSE, ECE, EEE,
ELECTRICAL, ETC, FAT, IT, MANUTECH, MECH, METTAMIN, MINERAL, MINING, MME
Time : 3 Hours
Max Marks : 100
Q.CODE : B997

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1   **Answer the following questions:** *multiple type or dash fill up type*   **(2 x 10)**

a) Five lamps are connected in series. Each lamp requires 16V and 0.1 A. The total power consumed is ------------------Watt.

b) A current of 8 A charges an insulator for 3 s. The charge accumulate is------------C

c) A 500V/100V, single-phase transformer takes a full-load primary current of 4A. The full-load secondary current is ------------------- A

d) A generator gives 20 A current at a voltage of 240V. The power taken by the load is ---------------------

e) A washing-machine motor of 420 W draws 4 A from a 110 V ac line. The power factor of the motor is -----------------------

f) An electric heater requires 23 A at 110 V and consume the energy for 8 hour. If the company charges at the rate 6 Rs/kW-h, the total amount to be paid is -------------

g) A coil has an mmf of 500 AT and a reluctance of $2 \times 10^6 \, AT/wb$. The total flux in the magnetic circuit is --------------------------

h) The frequency of the audio range extends from 20 Hz to 20 KHz. The range of wavelength over the range of audio frequencies is ---------------------

i) A steady current of 20 mA is passed through with an inductance of 100mH. The voltage induced by the coil is -----------------------

j) The poles of an alternator with 900 rpm at 60 Hz is --------------------

Q2   **Answer the following questions:** *Short answer type*   **(2 x 10)**

a) What is an alternator ? Give the classifications of AC machines ?

b) Why high permeability magnetic material is chosen for electrical apparatus ? How the permeability is related the flux density and field intensity ?

c) A flux of 400µWb passing through a 150-turn coil is reversed in 40ms. Find the average e.m.f. induced.

d) A carbon resistor has a resistance of $1 \, k\Omega$ at $0\,^{\circ}C$. Determine its resistance at $80\,^{\circ}C$. Assume that the temperature coefficient of resistance for carbon at $0\,^{\circ}C$ is $-0.0005/\,^{\circ}C$.

e) What is the difference between the steady state solution and transient solution of a response ?

f) Define form factor and peak factor of a sine wave.

g) What do you mean by an ideal transformer ?

h) The equation of alternating current is $i = 4 + 4\sin wt$. Then find the rms value of the complex current.

i) What is the function of brush and commutator in DC machines ?

j) Define time constant of a first order system.

Q3 **a)** An alternating voltage given by $v = 100 \sin 240t$ volts is applied across a coil **(10)** of resistance 32 Ω. and inductance 100mH. Determine (a) the circuit impedance, (b) the current flowing, (c) the p.d. across the resistance, and (d) the p.d. across the inductance.(e) power factor of the complete circuit

b) Write down the principle of operation of a DC generator. An 8-pole, wave- **(5)** connected armature has 600 conductors and is driven at 625rev/min. If the flux per pole is 20mWb, determine the generated e.m.f.

Q4 **a)** Find the form factor and peak factor of the following wave form. **(10)**
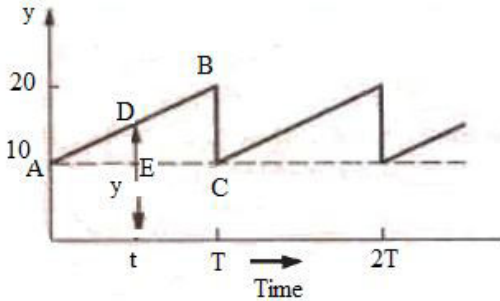
b) A silicon iron ring of cross-sectional area 5cm^2 has a radial air gap of 2mm cut **(5)** into it. If the mean length of the silicon iron path is 40cm, calculate the magnetomotive force to produce a flux of 0.7mWb.

Q5 **a)** What do you mean by transient of a response ? Derive the current growth and **(10)** current fall equation for the R-L series circuit when DC battery is connected and disconnected respectively.

b) The p.d. at the terminals of a battery is 25V when no load is connected and **(5)** 24V when a load taking 10A is connected. Determine the internal resistance of the battery.

Q6 **a)** Explain the detail construction and principle of operation of an three phase **(10)** induction motor ? Draw the torque-slip characteristics of the induction motor.

b) If the voltage and current supplied to a circuit or load by a source are: **(5)** $V_s = 230\angle -30^0 V$, $I_s = 5\angle 30^0 A$. Determine: A) The power supplied by the source which is dissipated as heat. B) The power stored in reactive components in the circuit (load). C) The power factor angle and power factor

Q7 **a)** State and explain Superposition theorem. With the help of Superposition **(10)** theorem, compute the current I_{ab} in the circuit. All resistances are in ohms.
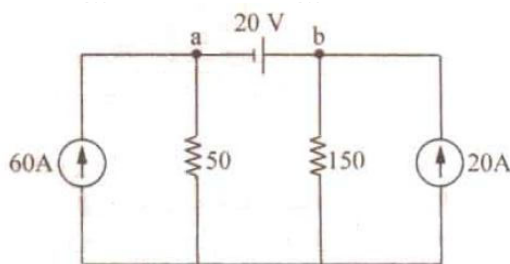
b) What do you mean by half power frequencies ? Derive the half power **(5)** frequencies for a R-L-C ac series circuit.

Q8 **a)** For the current $i_1 = 3\,\text{A}$, $i_2 = 10\cos t$ A, and $v_c = 5\sin t$ V. Find (a) i_L and v_L **(10)**
(b) v_{ab}, v_{bc} and v_{cd} (c) the energy stored in L and C as a function of time.
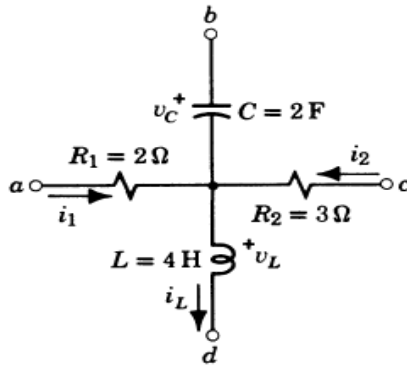
b) Draw and explain the torque-speed characteristics of a three phase induction **(5)**
motor.

Q9 **a)** Write the advantages of three phase supply ? A delta connected balanced **(10)**
three phase load is supplied from a three phase,400V supply. The line current
is 20 A and the power taken by the load is 10,000W. Find (i) Impedance in
each branch (ii) the line current, power factor and power consumed if the
same load is connected in star.

b) A coil has resistance of 300ohm and is switched on to a 110V d.c. supply.If **(5)**
the current reaches 62.3%of its final steady value in 0.002 second, determine
(i)the time constant of the circuit (ii) the inductance of the circuit (iii)the
maximum circuit current (iv) the initial rate of rise of current.