Registration No:

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B.TECH
15BE2102

1st Semester Back Examination 2016-17
BASIC ELECTRICAL ENGINEERING
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 100
Q.CODE: Y562

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions:** ***[multiple_choice_types with one correct answer from options (A), (B), (C) and (D)].*** **(2 x 10)**

a) The expression for the total effective resistance when two resistances R_1 and R_2 are connected in parallel is (A) R_1+R_2, (B) $R_1.R_2$, (C) Reciprocal of ((1/R_1)+(1/R_2)), (D) None of these.

b) The time constant of a RC series circuit is (A) R/C, (B) $\log_e$ (RC), (C) (1/RC), (D) RC.

c) The time constant of a RL series circuit is (A) (R/L), (B) (L/R), (C) (1/RL), (D) RL.

d) The expression for the frequency ‘f’ (in Hz) of the generated emf in a three phase synchronous generator running at ‘N’ RPM with ‘P’ number of poles is given by (A) f=PN/2, (B) f=PN/60, (C) f=PN/120, (D) f=PN/50.

e) The expression for ‘Reluctance R’ in a magnetic circuit is given by (A) R=(L/μA) (B) R=(A/μL) (C) R=(μA/L) (D) R=(μL/A), where μ, L and A are the permeability, length and area of cross section of the magnetic flux path respectively.

f) Two currents (10+j10) amperes and (5-j10) amperes, when added together, will give a resultant current of (A) (15-j20) amperes, (B) (15+j20) amperes, (C) (20+j15) amperes, (D) (15+j0) amperes.

g) The unit of ‘Conductance’ is (A) Ohm, (B) Henry, (C) Siemens (D) Ampere.

h) The charge Q accumulated in a Capacitor with capacitance C and the voltage across it being V is given by the relation (A) Q=V/C, (B) Q=C/V, (C) Q=1/(VC), (D) Q=CV.

i) The expression for the ‘Energy stored’ in an inductor with inductance L when a current I flows through it is (A) $(½)LI^2$ (B) $(½)L^2I$ (C) $(½)(LI)^2$ (D) $(¼)LI^2$.

j) The field current of a d.c. shunt generator with the field resistance being equal to 200 ohms and the voltage across the field winding being equal to 220 V is (A) 2 A, (B) 2.2 A, (C) 1.1 A, (D) 1 A.

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

a) Explain very briefly the superposition principle of finding out current in one particular branch of a network containing several voltage and current sources.

b) What is the equation of a sinusoidal current of 100 Hz frequency having an rms value of 80 A?

c) Calculate the power dissipated in a resistor of 20 ohms when it is connected across a potential difference of 100 volts. What is the energy transferred to heat if the resistor is connected to supply for 10 minutes?

d) A condenser of 5-microfarad capacitance is connected to a d.c. source through a resistance of 500 kilo-ohms. Calculate the time constant of this RC circuit.

e) What will be the resultant impedance in rectangular form when two impedances $10\angle{-45^o}$ and $20\angle{45^o}$ are connected in parallel?

f) An electromagnet has an airgap of 3 mm and the flux density in the gap is 1.3 Tesla. Calculate the ampere-turns required by the gap.

g) A coil of resistance R = 3 ohms and inductance L = 0.3 henry is switched on to a 120 V d.c. supply. Calculate the time constant of this RL circuit.

h) A voltmeter V of 25 kilo-ohm resistance when connected across a load resistance R reads 250 volts. What is the value of R if the total current supplied to V and R combination is 0.1 ampere?

i) Find the impedance of the circuit when an alternating voltage 100+j100 V is applied to it and the resulting current becomes 20-j20 A.

j) Write down the induced emf expression for a d.c. generator and name the various terms associated with it.

Part – B (Answer any four questions)

Q3 a) Compute the voltage across the 0.05-ohm resistor connected between nodes D and B in Fig.1 using Kirchoff's Laws. **(10)**

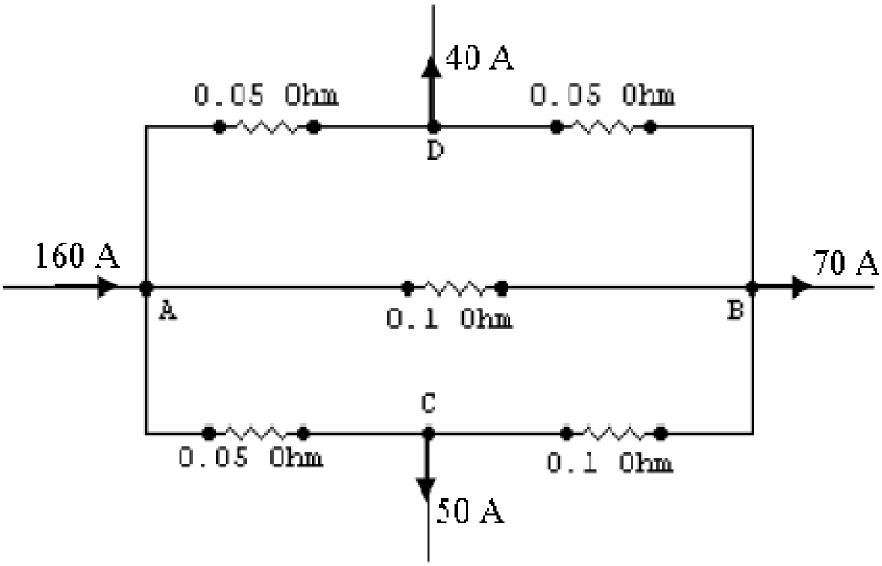

Fig.1

b) Explain the terms 'rms value' and 'average value' for an alternating quantity and determine these values for a sinusoidal current. **(5)**

Q4 **a)** In the parallel circuit shown in Fig.2, the voltage across the 3-ohm resistor is 15 volts. Calculate the total current I and draw the complete phasor diagram. **(10)**

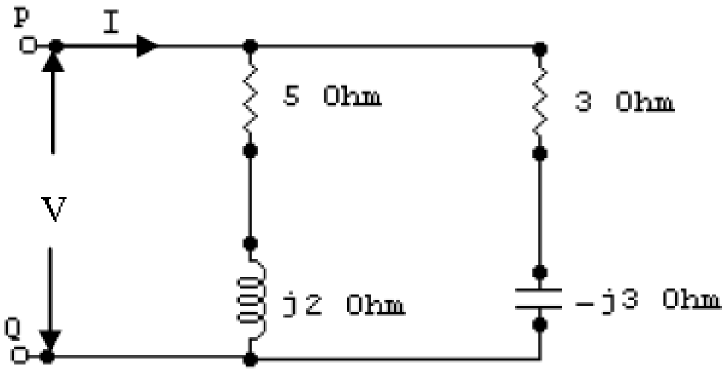

Fig.2

b) An inductance of 0.75 henry is connected in series with a capacitance of 0.75 micro-farad. Find the impedance of the circuit when the frequency is (i) 75 Hz, and (ii) 15 kHz. **(5)**

Q5 **a)** How the current will grow when a d.c. supply of certain magnitude is suddenly switched on to a series resistance-inductance (R-L) load circuit? Derive the expression for the growth of current with respect to time. What will be the steady state value of the current through the inductance L? **(10)**

b) State and explain the ‘superposition principle’ with an example. **(5)**

Q6 **a)** A current of 7 A flows through a non-inductive resistance in series with a coil when supplied at 240 V, 50 Hz. If the voltage across the resistance is 120 V and across the coil, it is 195 V, calculate (i) the impedance, reactance, and resistance of the coil, (ii) the power absorbed by the coil, and (iii) the total power. Draw the complete phasor diagram. **(10)**

b) State and explain the ‘maximum power transfer principle’ with an example. **(5)**

Q7 **a)** A magnetic circuit comprises two parts in series, each of uniform cross sectional area (c.s.a.). The two parts are: (a) iron of length 150 mm and c.s.a. 75 mm^2; and (b) an airgap of length of 0.5 mm and c.s.a. 85 mm^2. A coil of 1500 turns is wound on the iron part, and the flux density in the airgap is 0.5 T. The relative permeability of iron is 2000. Estimate the coil current assuming all the flux to pass through the given magnetic circuit. Neglect fringing. **(10)**

b) Describe the various methods of excitation provided in d.c. machines. Show the field connection diagram of a long shunt d.c. compound machine. **(5)**

Q8 **a)** Draw and explain the typical B-H curve for a magnetic material. What do you mean by the terms ‘saturation’, ‘hysteresis loss’, ‘eddy current loss’ and ‘residual magnetisation’? Explain. **(10)**

b) Write short notes on residential wiring, grounding and safety. **(5)**

Q9 **a)** Explain in detail how a digital signal gets converted to its analog form using a digital-to-analog converter (DAC). Give one example of this digital-to-analog (D/A) conversion. **(10)**

b) What are time dependent signal sources? Give two examples of periodic signals those appear frequently in practical applications. **(5)**