Registration no: | | | | | | | | | | |

Total Number of Pages: 03 **B.Tech**
BE2102

1st Semester Back Examination 2016-17
BASIC ELECTRICAL ENGINEERING
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 70
Q.CODE: Y563

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

Q1 Answer the following questions: **(2 x 10)**

a) A resistor of 10 ohms is connected across a potential difference of 50 volts. Calculate the power dissipated and the energy transferred to heat in 5 minutes.

b) A condenser of 10-microfarad capacitance is connected to a d.c. source through a resistance of 500 kilo-ohms. Calculate the time taken for the condenser to receive 63.2% of its final charge.

c) A coil has a resistance of 10 ohms and inductance of 1 henry. What will be the value of current after 0.1 second of switching this coil to a 200 V d.c. supply?

d) Two impedances $20\angle -30^o$ and $15\angle 45^o$ are connected in series. Find out the resultant impedance in polar form.

e) Write down the equation of a sinusoidal source voltage of 60 Hz frequency having a root-mean-square magnitude of 300 V.

f) Calculate the frequency of induced emf in a 6-pole three-phase synchronous generator running at 1000 RPM with the help of a prime mover.

g) Three resistors A, B and C having resistance values of 20 ohms, 25 ohms and 50 ohms respectively are connected in parallel across a source. What will be their resultant single value equivalent resistance so as to draw the same current from the same source?

h) An iron ring has a circular cross section of 5 cm diameter and a mean circumference of 100 cm. Calculate the reluctance offered by the iron ring assuming its relative permeability to be equal to 1000. ($\mu_0 = 4\pi \times 10^{-7}$ H/m).

i) A voltmeter V of 20 kilo-ohm resistance connected across a load resistance R reads 200 volts. What is the value of R if the total current supplied to V and R combination is 0.05 ampere?

j) A balanced star-connected load of 15+j10 ohms per phase is connected to a 3-phase 415 V supply. Find the line current and the power factor.

Q2 State and explain Kirchhoff's Voltage Law. **(2+8)**

In the following circuit of Fig.1, the voltage source Vs=200 V and the resistances are: R1= 25 ohms, R2= 20 ohms, R3= 50 ohms, R4= 60 ohms and R5= 60 ohms. Find the voltages V1 and V2 in the circuit using the Mesh-Current Analysis method.

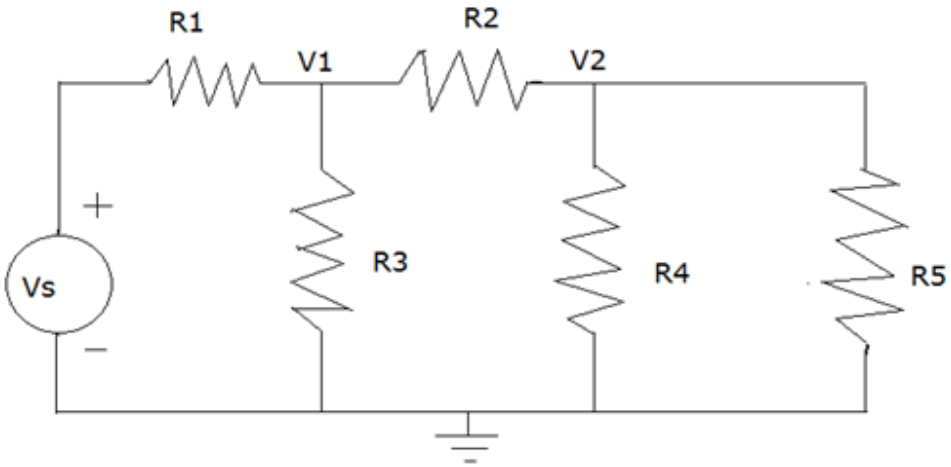

Fig.1

Q3 **a)** Explain the term 'rms value' for an alternating quantity. Derive the expression for the 'rms value' of a sinusoidally time-varying current with an amplitude of 'I_{max}' ampere. **(5)**

b) An inductance of 0.65 henry is in series with a capacitance of 0.9 micro-farad. Find the impedance of the circuit when the frequency is (i) 60 Hz, and (ii) 20 kHz. **(5)**

Q4 **a)** A coil of 15 ohms resistance is in parallel with a coil of 25 ohms resistance. This combination is connected in series with a third coil of 10 ohms resistance. If the whole circuit is connected across a battery having an emf of 50 V and an internal resistance of 1.5 ohm, calculate (i) the terminal voltage of the battery and (ii) the power dissipated in the 15-ohm coil. **(5)**

b) Explain the principle of operation of a single-phase two winding transformer. How the impedance on the low voltage side is referred to with respect to the high voltage side? **(5)**

Q5 **a)** An iron ring has a mean diameter of 50 cm and a cross sectional area of 7.5 cm^2. It is wound with a coil of 2000 turns. An airgap of 2 mm width is cut in the ring. If the current flowing in the coil is measured to be equal to 4 A, then determine the flux produced in the airgap, if the relative permeability of iron under these conditions is 1000. Neglect leakage and fringing. Given, $\mu_0 = 4\pi \times 10^{-7}$ H/m. **(5)**

b) A 3-phase, 3-wire, 440 volts, 50 Hz, *RYB* system of supply has a star connected load with $Z_{RN} = Z_{YN} = Z_{BN} = 100 \angle 45^0$ ohms, where '*N*' is the neutral point of the star connection. Obtain the three line currents and draw the phasor diagram showing the line voltages and line currents. **(5)**

Q6 **a)** Two impedances (3+j7) ohms and (5-j7) ohms are connected in parallel across a single phase 50-Hz source voltage with rms value of (100+j0) volts. Calculate the total current drawn from the source. What is the overall load power factor in this case? **(5)**

b) A 6-pole d.c. shunt generator has 1500 armature conductors in six parallel paths. The average flux per pole in the air gap is 0.065 weber. Calculate the generated emf if the generator runs at a speed of 1500 RPM with the help of a prime mover. **(5)**

Q7 Explain in detail how an analog voltage signal gets converted to its digital form (i.e. to a binary word) using an analog-to-digital converter (ADC). Give one example of this analog-to-digital (A/D) conversion. **(10)**

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) Magnetic materials and B-H curves.
b) Node voltage Analysis
c) Time dependent Signal Sources
d) D/A conversion.