INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL
B.Sc. (Applied Sciences) in Engg.
End – Semester Theory Examinations – May 2021 –Repeaters -2018 Batch
II SEMESTER: Elements of Electrical and Electronics [IEE 121]
(BRANCH: E & E)

Time: 3 Hours **Date: 20 May 2021** **Max. Marks: 100**

- ✓ **Answer ANY 5 FULL Questions.**
- ✓ **Missing data, if any, may be suitably assume.**

1A Derive the expression for instantaneous power and average power dissipated by a pure capacitor in an AC circuit. Plot the waveforms for inductor voltage, current and instantaneous power. **(10)**

1B The voltage applied to a purely inductive coil of self-inductance $30mH$ is given by the equation **(6)**

$$v(t) = 50\sin(156t) + 100\sin(470t) + 25\sin(786t)$$

Find the equation of the resulting current wave.

1C Evaluate the expression $v = v_1 + v_2$ using the phasor method and draw the phasor diagram. Given $v_1 = 5\sin(\omega t + 60^0)$ and $v_2 = -20\cos(\omega t - 45^0)$ **(4)**

2A Explain with the help of necessary diagrams the process of AC voltage generation. Derive the expression for the RMS value of AC sinusoidal voltage **(6)**

2B Determine the power factor, true power, reactive power and apparent power in the circuit shown in Fig.2B. **(4)**

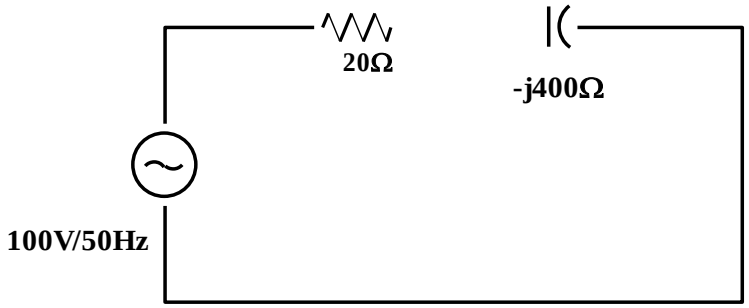

Fig.2B

2C Find the average value, RMS value, peak factor and form factor for the waveform shown in Fig.2C **(10)**

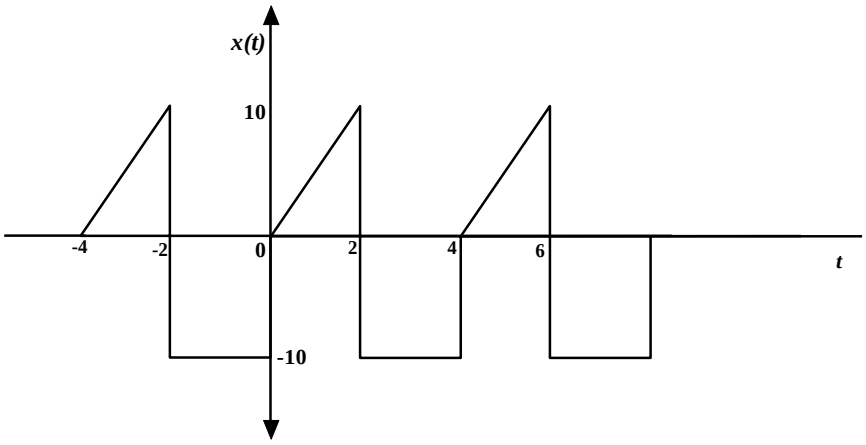

Fig.2C

3A Derive the expression for ripple factor and Transformer utilization factor in full wave rectifier. Draw the circuit diagram and plot necessary waveforms. **(6)**

3B For the circuit shown in Fig.3B, determine

a) DC output voltage
b) Rectification efficiency

Assume all the diodes are ideal. **(4)**

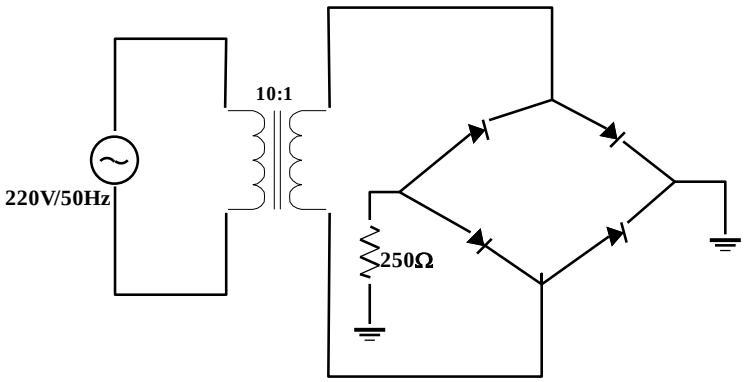

Fig.3B

3C A current 5A flows through a non-inductive resistance in series with choking coil when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and across coil is 200V. Calculate (i) impedance, resistance and reactance of the coil, (ii) The power absorbed by the coil and (iii) The total power. Draw the phasor diagram. **(10)**

4A Explain the working of a PN junction diode with the help of a neat diagram. Draw the VI characteristics of a PN junction diode. **(6)**

4B A resistor and capacitor is in series with a variable inductor is connected to 200V, 50Hz supply. The maximum current is 0.314A by varying the inductance. The voltage across the capacitor is 300V. Find the value of R, L and C. **(8)**

4C Draw the VI characteristics of Zener diode. Write down the differences between Zener breakdown and Avalanche breakdown. **(6)**

5A Find the equivalent resistance between the points A and B for the circuit shown in Fig.5A

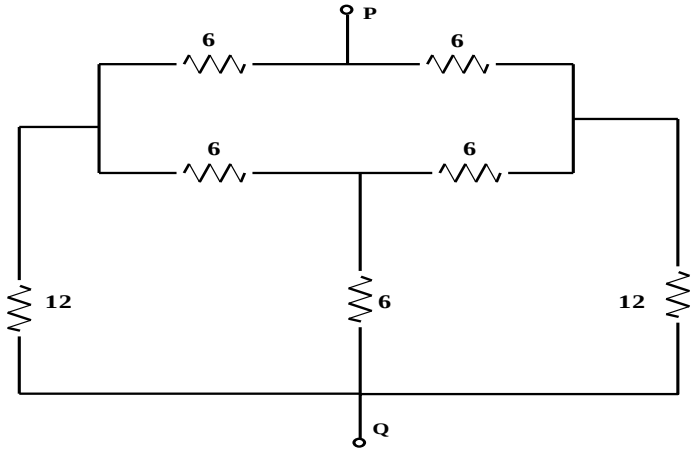

Fig.5A **(10)**

5B Explain the working of PNP transistor. Draw and explain the input and output characteristics of BJT in Common Emitter configuration. **(10)**

6A Find the instantaneous power and average power dissipated by a pure inductor in an AC circuit. Plot the waveforms for inductor voltage, current and instantaneous power **(10)**

6B Find the average value, RMS value, peak factor and form factor for the waveform shown in Fig.6B.

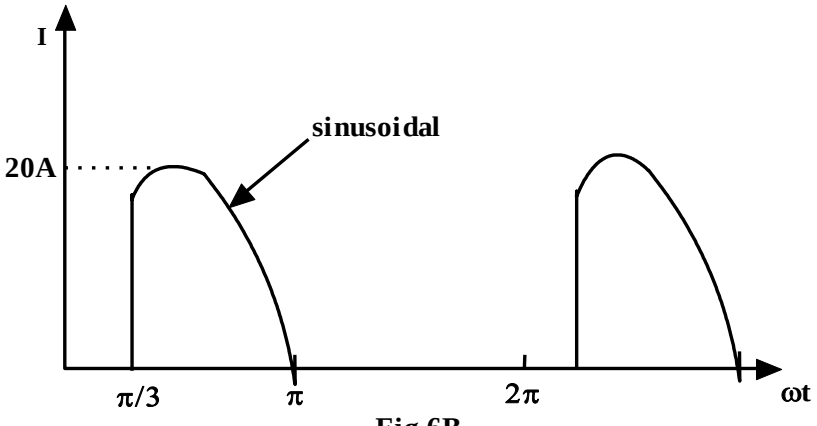

Fig.6B **(10)**

7A With the help of neat diagram explain RC coupled amplifier with special reference to frequency response advantages, disadvantages and application. **(10)**

7B Explain the construction and working of an induction motor. **(6)**

7C An AC supply voltage of 230V is applied to a half-wave rectifier circuit through a transformer of turns ration 20:1. Find (i) the output DC voltage (ii) the peak inverse voltage. Assume the diode to be ideal. **(4)**

8A Derive the expression for the resonant frequency of a series RLC circuit. Plot the graph for current, impedance and phase of resonant circuit with respect to frequency. **(10)**

8B A series RLC circuit is connected to an AC voltage source $v(t) = 96\sin(600t)$V.If $R = 600\Omega$ and $L = 0.8H$. What value of capacitance C is required to make the phase angle between $v(t)$ and $i(t)$ in the circuit equal to zero degrees. Find voltage across inductor and capacitor, Q factor, Bandwidth, I_{max}. **(10)**