Enrolment No.

S₁(UEE11B06)EE.

B.Tech 1st Semester (Group-I) End-term Examination, 2018

Name of Subject: Basic Electrical Engg.

Paper Code: UEE11B06

Full Marks: 100

Time: 3 hrs.

A. Answer the following questions: **2×10 = 20**

(a) Why algebraic sum of all the voltages in a closed loop in not zero in an ac circuit?

(b) Whether Superposition theorem is applicable for power measurement and why?

(c) Define active and reactive power.

(d) Derive the power factor of a purely inductive circuit.

(e) Define phase and phase sequence.

(f) What do you mean by balanced 3-Φ system? Write the advantage of interconnection of 3-phase system.

(g) State Faraday's laws of electromagnetic induction and Ampere's circuital law.

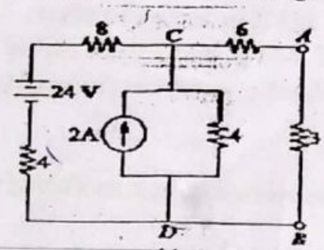
(h) Define active element and passive element with example.

(i) $V = \sqrt{2} \times 200 \cos 500t$, $P_{avg} = 250$ watt, power factor = 0.7 lagging. Calculate the reactive power of the system.

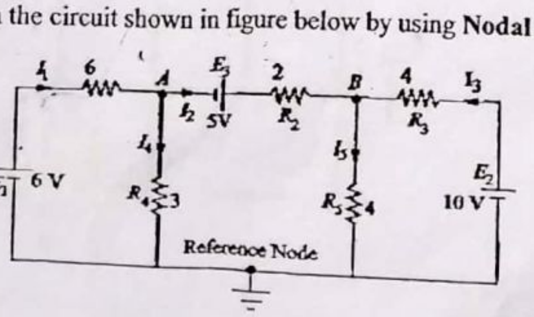
(j) Using Kirchhoff's current law and Ohm's law, find the magnitude and polarity of voltage V in the figure shown below.

B. Answer any 4 questions of the followings: **4×20=80**

1. (a) State **Norton's theorem**. With the help of **Norton's theorem**, calculate the current flowing through the 3 Ω resistor connected across AB of the network shown in Figure below. All resistances are in ohm.

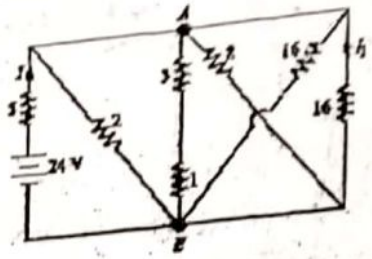


(b) Find the branch currents in the circuit shown in figure below by using **Nodal analysis method**.



P.T.O.

(c) Determine resistance between points A and B in the network given below. All resistances are in ohm.



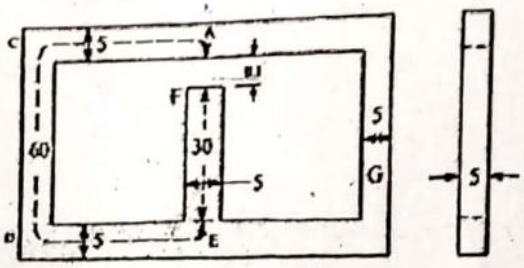
(2+6)+8+4=20

2. (a) Define MMF and Reluctance. Define Self inductance and Mutual inductance.

(b) Define Hysteresis loss and Eddy current loss. Determine equivalent inductance of two coils, when the coils are connected in parallel such that mutual inductance assists the self-inductance.

(c) A cast steel d.c. electromagnet shown in Fig. below has a coil of 1000 turns on its central limb. Determine the current that the coil should carry to produce a flux of 2.5 mWb in the air-gap. Neglect leakage. Dimensions are given in cm. The magnetization curve for cast steel is:

Flux density (Wb/m^2) :	0.2	0.5	0.7	1.0	1.2
Amp-turns/metre :	300	540	650	900	1150

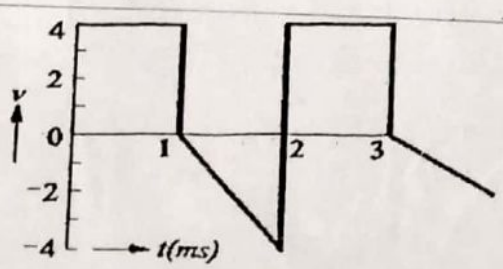


(2+2)+(3+5)+8=20

3. (a) Define coefficient of coupling. Prove that coefficient of coupling between two coils is $K=\frac{M}{\sqrt{L_1 L_2}}$, where M is the mutual inductance and L_1, L_2 are the self inductances of the two coils.

(b) Two identical 750 turn coils A and B lie in parallel planes. A current changing at the rate of 1500 A/sec in A induces an emf of 11.25 V in B. calculate the mutual inductance of the arrangement. If the self-inductance of each coil is 15 mH, calculate the flux produced in coil A per ampere and the percentage of this flux which links with coil B.

(c) Define form factor. Calculate the average and r.m.s values of the voltage waveform shown in figure below.



[(1+5) +5+ (1+8)]=20

P.T.O.

4. (a) Derive the expression of average power for RC series circuit.

(b) Describe the working principle of transformer.

(c) A 25 kVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000 V, 50 Hz supply. Find the full load primary and secondary currents, the secondary emf and the maximum flux in the core.

(d) In a series-parallel circuit, the parallel branches A and B are in series with C. The impedances are $Z_A = (3 + j4)\ \Omega$, $Z_B = (5 - j12)\ \Omega$ and $Z_C = (8 + j6)\ \Omega$. If the voltage applied to the circuit is 200 V at 50 Hz, calculate (i) current I_A, I_B and I_C, (ii) active power dissipated in the three resistive branches and (iii) power factor of the circuit.

3+3+4+10=20

5. (a) Derive the relationship between (i) line voltage and phase voltage, (ii) line current and phase current of a balanced 3-Φ star connected system.

(b) Three identical coils are connected in star to a 200 V, 3-phase supply and each takes 400 W. The p.f. is 0.8 lagging. What will be magnitude of line currents and total power if the same coils are connected in delta to the same supply? If the total power in delta connected coils is measured by two wattmeter method, what will be the reading of the wattmeters.

(c) A series circuit has R = 10 Ω, L = 50 mH and C = 100 μF and is supplied with 200 V, 50 Hz. Find (i) impedance, (ii) current, (iii) power, (iv) power factor, (v) voltage drop across each element.

5+7+8=20

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B.Tech 1st Semester (Group-I) End-term Examination, 2017

Name of Subject : Basic Electrical Engg.

Paper Code : UAD11B06

Time: 3 hrs.

Full Marks: 100

2×10=20

A. Answer the following questions:

(a) What is the significance of form factor and peak factor?

(b) Prove that current flowing through a purely inductive circuit lags behind applied voltage by 90°.

(c) What do you mean by active power and apparent power?

(d) Define RMS value and Phase sequence.

(e) Compare electic and magnetic circuit with respect to their similarities.

(f) State Fleming's right hand rule. What do you mean by leakage flux?

(g) What is hysteresis loss? On what factors does it depend?

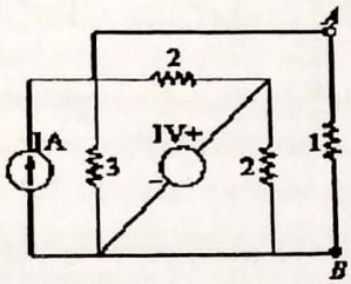
(h) Why 3-phase system is interconnected in the form of star or delta connection ?

(i) In a series R-L circuit, the voltage and current are expressed as: $v(t) = 20 \sin (314t + 2\pi/3)$ and $i(t) = 4 \sin (314t + \pi/2)$. Determine the average power and power factor of the circuit.

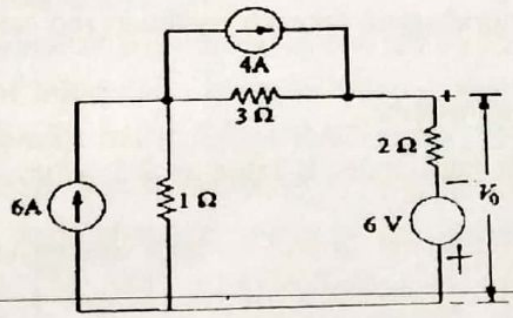
(j) A 4 Ω resistor is connected to a 10 mH inductor across a 100 V, 50 Hz voltage source. Find input current and reactive power of the circuit.

B. Answer any 4 questions of the followings: 4×20=80

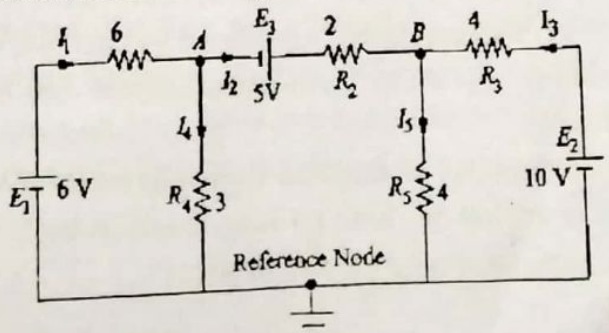
1. (a) Using **Thevenin's theorem**, determine current flowing through 1Ω resistor across AB of the network shown in figure below.



(b) Using **Superposition theorem**, find the value of output voltage V_0 in the circuit shown in figure below.



(c) Find the branch currents in the circuit shown in figure below by using **Nodal analysis method**.



|6+7+7|=20

2. (a) Define MMF and Reluctance.

(b) State Faraday's law of Electromagnetic induction. Prove that coefficient of coupling between two coils is $K = \frac{M}{\sqrt{L_1 . L_2}}$, where M is the mutual inductance and L_1, L_2 are the self inductances of the two coils.

(c) A metal ring of mean diameter of 80 cm is made up of two semi-circular pieces of cast iron and cast steel separated at junctions by pieces of copper each of 1 mm thickness. If the ring is uniformly wound with 1000 turns, calculate the value of current required to produce a flux density of 0.85 wb/m^2 in the ring. The relative permeabilities of cast iron and cast steel are 200 and 1200 respectively and for copper $\mu_r = 1$.

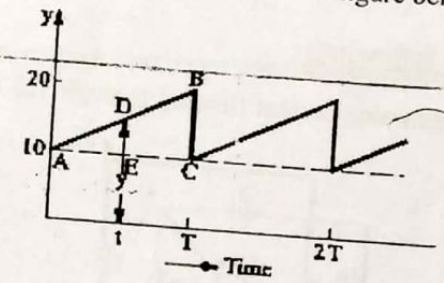
[2+(2+6)+10]=20

3. (a) Define self inductance and mutual inductance.

(b) Two coils of self-inductances L_1 and L_2 are connected in series and the mutual inductance between them is M. Determine the equivalent inductance of the coils if their (i) mmf are additive and (ii) mmf are subtractive.

(c) The combined inductances of two coils connected in series are 0.6 H and 0.1 H respectively when connected to magnetise in the same direction and in the opposite directon. If the coefficient of coupling between the coils is 0.72, calculate (i) self inductances of the two coils and (ii) mutual inductance between them.

(d) Find the average and r.m.s values of the waveform shown in figure below.



[2+5+5+8]=20

4. (a) Explain with diagram the measurement of 3-phase power by two-wattmeter method.

(b) A coil is in series with a 20 μF capacitor across a 230 V, 50 Hz supply. The current taken by the circuit is 8 A and the power consumed is 200 W. Calculate the inductance of the coil if the power factor of the circuit is (i) leading (ii) lagging. Draw the vector diagram for each condition and calculate the coil power factor in each case.

(c) Describe the working principle of transformer.

(d) A 10 KVA, 6600/220 V, 50 Hz transformer is rated as 2.5 V/turn of the winding coils. Assume the transformer to be ideal and calculate
(i) the voltage transformation ratio, (ii) the total turns of the high voltage and low voltage coil, (iii) the primary and secondary current of the transformer.

[4+8+(3+5)]=20

5. (a) Two impedances $Z_1 = (8 + j6)\ \Omega$ and $Z_2 = (3 - j4)\ \Omega$ are connected in parallel. If the total current of the combination is 25 A, find the current taken and power consumed by each impedance. Draw vector diagram.

(b) Derive the relationship between (i) line current and phase current (ii) line voltage and phase voltage of a balanced 3-Φ star connected system.

(c) A delta connected balanced 3-phase load is supplied from 3-phase,400 V supply. The line current is 20 A and the power taken by the load is 10,000 W. Find (i) impedance in each branch (ii) the line current, power factor and power consumed if the same load is connected in star.

[8+6+6]=20

B.Tech 1st Semester End-term Examination, 2016

Name of Subject: Basic Electrical Engg.

Paper Code: UAD11B06

Full Marks: 100 Time 2×10

A. Answer the followings questions:

(a) Define active and reactive power.

(b) Prove that the current flowing through a purely capacitive circuit lags behind applied vol by 90 °.

(c) What do you mean by retentivity and coercivity of a magnetic material?

(d) Define Time period, peak value of an alternating quantity.

(e) Compare electic and magnetic circuit with respect to their dissimilarities.

(f) State Faraday's laws of electromagnetic induction. What do you mean by leakage factor?

(g) What do you understand by eddy current loss? On what factors does it depend?.

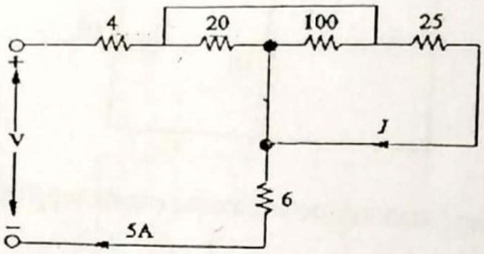
(h) Define the terms:- (i) 3- phase balanced supply (ii) Phase sequence

(i) A coil has resistance of 10 Ω and draws a current of 5 A when connected across 100 v, 50 Hz source. Determine the reactive power of the circuit.

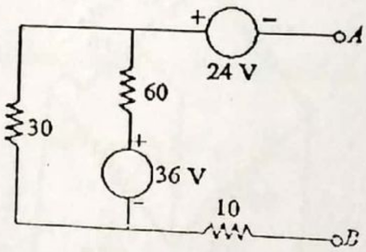
(j) An a.c. voltage and current expression are given by v= 200 sin ωt.andi= 100 sin(ωt+π/6). Calculate impedance and power factor.

B. Answer any 4 of the followings: 4×20=80

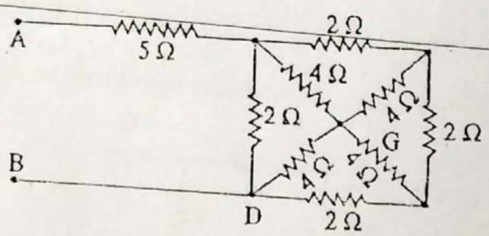
1. (a) In the circuit shown in figure below calculate (i) current through 25 Ω resistor (ii) supply voltage V.



(b) Using Norton's theorem, determine the current which would flow in a6 Ω resistor connected across AB of the network shown in fig below.



(c) Use delta-star conversion to find resistance between terminals AB of the circuit shown in figure below. All resistances are in ohms.



[6+6+8]

2. (a) Show that the area of the hysteresis loop is proportional to the work done in carrying a magnetic substance through a cycle of magnetization.

(b) A cast steel d.c. electromagnet shown in Fig. below has a coil of 1000 turns on its central limb. Determine the current that the coil should carry to produce a flux of 2.5 mWb in the air-gap. Neglect leakage. Dimensions are given in cm. The magnetisation curve for cast steel is as under :

Flux density (Wb/m²)	0.2	[illegible]	0.7	1.0	[illegible]
Amp-turn/metre	[illegible]	[illegible]	650	[illegible]	[illegible]

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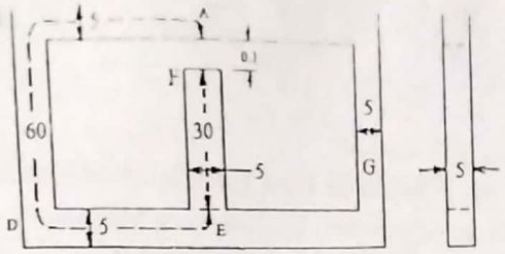
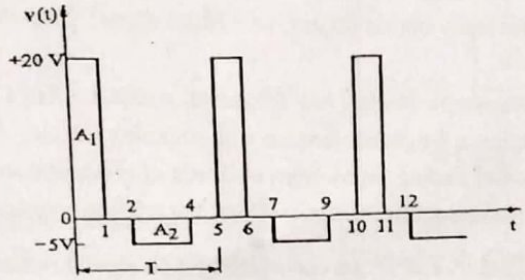


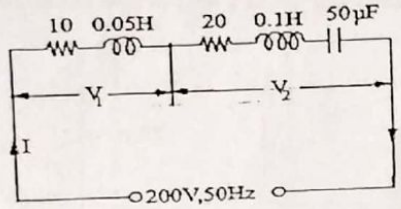
) Two identical coils with terminals T_1T_2 and T_3T_4 respectively are placed side by side. The inductances measured under different sets of connections are as follows:
(i) When $T_2$is connected to $T_3$and inductance measured between T_1 and T_4 is 4 H.
(ii) When T_2 is connected to T_4 and inductances measured between T_1 and T_3 is 0.8 H. Determine the self inductance of each coil and the coefficient of coupling.

[6+8+6]

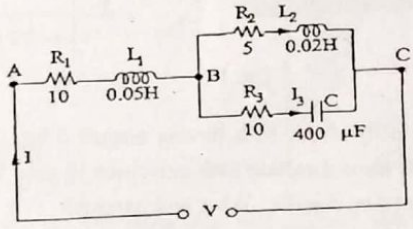
(a) Find the average and rms values of ac voltage whose waveform is given in figure below.



(b) Draw a vector for the circuit shown in figure indicating the resistance and reactance drops, the terminal voltages V_1 and V_2 and the current. Find the values of (i) the current I (ii) V_1 and V_2 and (iii) p.f.



(c) In the circuit shown in figure below, determine the voltage at a frequency of 50 Hz to be applied across AB in order that the current in the circuit is 10 A. Draw the phasor diagram.



[5+7+8]

4.(a) What do you mean by balanced 3 phase system? Derive the relation between (i) line voltage and phase voltage and (ii) line current and phase current in case of a balanced 3Φ delta connected system, also calculate the total power.

(b) A balanced delta connected load, consisting of three coils, draws $10\sqrt{3}$ A at 0.5 power factor from 100 V, 3 phase supply. If the coils are re-connected in star across the same supply, find the line current and total power consumed.

(c) Each phase of a 3 phase, delta connected load consists of an impedance $Z = 20\angle 60°$ ohm. The line voltage is 440 V at 50 Hz. Compute the power consumed by each phase impedance and total power. What will be the readings of the two wattmeter connected.

[(2+6)+6+6]

5.(a) Derive the emf equation of an ideal transformer.
(b) A single phase 50 Hz transformer has 100 turns on the primary winding and 400 turns on the secondary winding. The net cross-sectional area of the core is 250 cm^2. If the primary winding is connected to a 230 V, 50 Hz supply, determine (i) the emf induced in secondary winding and (ii) the maximum value of the flux density in the core.
(c) Two coils A and B are connected in series across a 240 V, 50 Hz supply. The resistance of A is 5 Ω and the inductance of A is 0.015 H. If the input from the supply is 2 kW and 2.5 kVAR, find the inductance of coil A and the resistance of coil B. Calculate the voltage across each coil.

[5+7+8]

S.(UAD11B06)LL

B.Tech 1st Semester End-term Examination, 2015
Name of Subject: Basic Electrical Engg.
Paper Code:UAD11B06

Marks: 100 Time: 3 hrs.

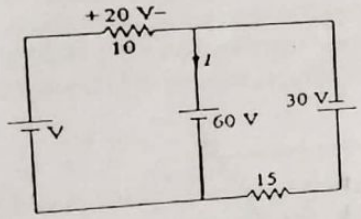
A. Choose the correct alternatives from the followings: 2×10=20

(a) Define self and mutually induced emf.
(b) What do you mean by retentivity and coercivity of a magnetic material?
(c) Differetiate between form and peak factor.
(d) State Faraday's law of electromagnetic induction.
(e) Define MMF and reluctance.
(f) Differentiate impedance and admittance.
(g) Write down some advantages of 3Φ system over single phase system.
(h) Define line voltage and phase voltage in a 3Φ system.
(i) Prove that the average power in a purely capacitive circuit is zero.
(j) An a.c. current given by $i = 14.14 \sin(\omega t + \pi/6)$. Calculate rms and average value.

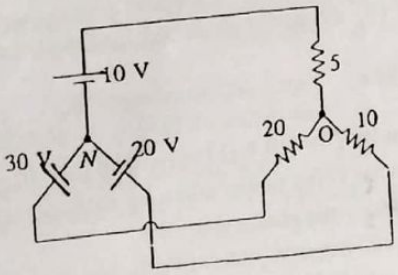
B. Answer any 4 of the followings: 4×20=80

1.(a) Define the terms : (i) Ideal constant voltage source (ii) Active and Passive network

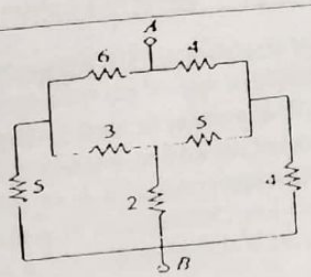
(b) Using KVL and KCL, find the values of V and I in the circuit shown in fig. below. All resistances are in ohms.



(c) Using Norton's theorem, determine the current flowing through 25Ω resistor connected between points N and O as shown in fig below.



(d) For the circuit shown in figure below determine the resistance between points A and B.



[2+4+6+8]

2.(a) Show that $K = \frac{M}{\sqrt{L1L2}}$, $K < 1$

where L1 and L2 are inductances of coil1 and coil2 respectively and K is co-efficient of coupling.

(b) What is meant by eddy current loss and Magnetic hysteresis?

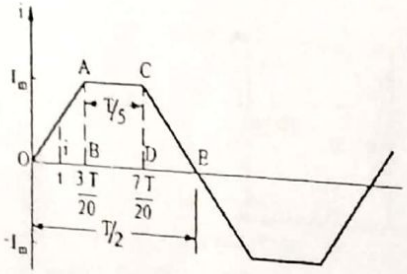
(c) Two coils of self inductancesL1 and L2 are placed side by side and the mutual inductace between them is M. if the coils are connected in series then derive the expression for the net inductance of the coils when their (i) mmf are additive and (ii) mmf are subtractive

(d) Two identical 750 turns coils A and B are connected in parallel. A current changing at the rate of 1500 A/s in A induces an emf of 11.25 V in B. Calculate the mutual inductance of the arrangement. If Theself inductance of each coil is 15mH, calculate the flux produced in coil A per Ampere and the percentage of this flux which links with B.

3. (a) What do you mean by phase and phase difference ? [4+6+6+4]

(b) An alternating current with peak-peak value of 20V passes the first zero at 60°. Write- down the instanteneous current euqation. Draw the waveform.

(c) Find the rms and average valuefor the trapezoidal current waveform shown in fig. below.



(d) A current of 5A flows through a non-inductive resistance of 25 Ω in series with a choking coil when supplied at 250-V, 50-Hz. If the voltage across the resistance is 125 V and across the coil 200 V, calculate (a) impedance, reactance and resistance of the coil (b) the power absorbed by the coil and (c) the total power. Draw the vector diagram.

4.(a) Two circuits, the impedance of which are given by Z1= (10 + j15) ohm and Z2= (6 - j8) ohm are connected in parallel. If the total current supplied is 15 A, what is the power taken by each branch? Find also the power factor of individual circuits and of combination. Draw the phasor diagram. [2+2+8+8]

(b) Derive the expression for instantaneous power and average power in a single phase series RL circuit.

(c) Define active reactive and apparent power.

(d) Prove that two wattmeter are sufficient to measure total power in a 3 phase system.

5.(a) Derive the relation between (i) line voltage and phase voltage and (ii) line current and phase current in case of a balanced 3Φ star connected system [7+4+3+6]

(b) Three equal star connected inductors take 8 KW at a power factor 0.8 when connected across a 460 V, 3Φ, 3-wire supply. Find the circuit constants (R and X) of the load per phase

(c) Explain the principle of operation of an ideal transformer.

(d) A 6600/220 V, 50 Hz single phase transformer has 1500 turns on its primary side. Find (i) the secondary turns, (ii) the effective cross sectional area of its core if the maximum flux density is 1.2 tesla [5+5+4+6]

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