

SECTION A : 20 MARKS
BAHAGIAN A : 20 MARKAH

INSTRUCTION:

This section consists of **TWENTY (20)** objective questions. Mark your answers in the OMR form provided.

ARAHAN :

Bahagian ini mengandungi **DUA PULUH (20)** soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.

CLO1
C1

1. Faraday's law states that the magnitude of the e.m.f. induced in a circuit is proportional to the magnitude of the flux linking the circuit.

Faraday hukum menyatakan bahawa magnitud d.g.e yang dihasilkan dalam sebuah litar berkadar terus dengan magnitud fluks dalam litar.

A. TRUE/BETUL B. FALSE/SALAH

CLO1
C2

2. In the Diagram A2, waveform A lags waveform B by 90 degrees.

Merujuk Rajah A1, bentuk gelombang A mengekor gelombang B 90 darjah.

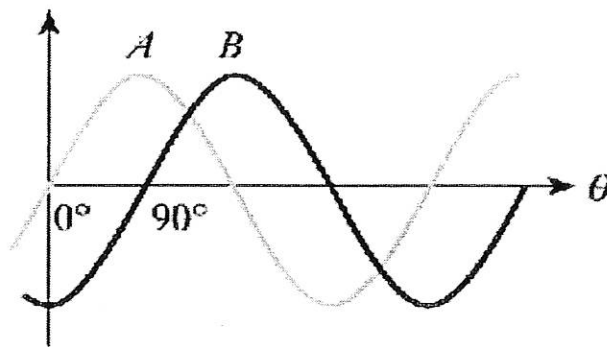


Diagram A2/ Rajah A1

A. TRUE/BETUL B. FALSE/SALAH

CLO1
C2

3. As the frequency increases in a series RL circuit the impedance also increases.

Sekiranya nilai frekuensi dalam litar siri RL ditingkatkan, nilai galangan juga akan meningkat.

A. TRUE/BETUL B. FALSE/SALAH

SULIT

POLITEKNIK
Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2013

ET201: ELECTRICAL CIRCUITS

TARIKH : 29 OKTOBER 2013

TEMPOH : 2 JAM (8.30 AM - 10.30 AM)

Kertas ini mengandungi **TUJUH BELAS (17)** halaman bercetak.

Bahagian A: Objektif (20 soalan)

Bahagian B: Struktur (10 soalan)

Bahagian C: Esei (2 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

CLO2
C2

7. Convert a complex impedance of $150 + j200 \Omega$ into a polar form.

Tukarkan galangan kompleks $150 + j200 \Omega$ ke bentuk kutub.

- A. $|Z| = 150; \angle = 60^\circ$ C. $|Z| = 275; \angle = 30^\circ$
 B. $|Z| = 250; \angle = 53^\circ$ D. $|Z| = 350; \angle = 47^\circ$

CLO1
C2

8. Which one of the following statements is correct in relation to alternating waveforms?

Antara pernyataan berikut yang BENAR berkaitan gelombang ulang alik?

- A. In a capacitor, the current leads the voltage.
Dalam kapasitor, arus mendahului voltan.
- B. In a capacitor, the voltage leads the current.
Dalam kapasitor, voltan mendahului arus.
- C. In an inductor, the current leads the voltage.
Dalam pengaruh, arus mendahului voltan.
- D. In an inductor the voltage lags the current.
Dalam pengaruh, voltan mengekor arus.

CLO1
C1

9. When a sinusoidal voltage is applied across a resistance, R , how is the average power, P , related to the r.m.s. voltage, V , and the r.m.s. current, I ?

Apabila voltan sinus digunakan di seluruh rintangan, R , bagaimana kuasa purata, P , yang berkaitan dengan voltan ppgd, V , dan arus ppgd, I ?

- A. $P = VIR$ C. $P = VI$
 B. $P = VI^2$ D. $P = V^2I$

CLO1
C2

4. When we wish to divide one complex quantity by another, the computation is much simpler if we express each quantity in polar form.

Apabila kita ingin membahagikan satu kuantiti yang kompleks dengan yang lain, pengiraan adalah lebih mudah jika kita menyatakan setiap kuantiti dalam bentuk kutub.

A. TRUE/BETUL

B. FALSE/SALAH

CLO2
C3

5. Which of the following equations describes the waveform shown in Figure A5?

Antara berikut yang manakah menunjukkan persamaan bagi gelombang di Rajah A5?

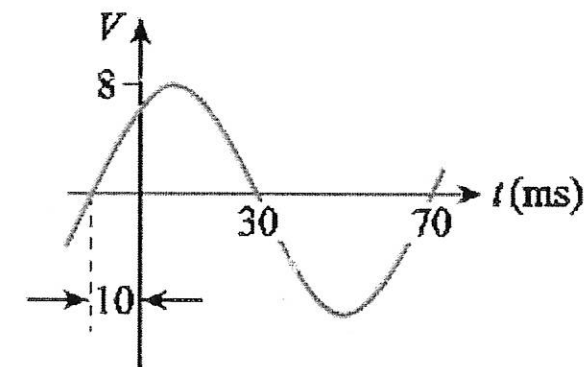


Figure A5/ Rajah A5

- A. $v = 8 \sin(79t - \pi/4)$
 B. $v = 8 \sin(79t + \pi/4)$
 C. $v = 8 \sin(90t + \pi/4)$
 D. $v = 8 \sin(90t - \pi/4)$

CLO2
C3

6. A half-cycle average voltage of 12 V is equal to what rms voltage?

Sepuluh gelombang voltan purata 12 V bersamaan dengan apa bagi nilai voltan ppgd?

- A. 7.64 C. 13.33
 B. 8.48 D. 18.84

CLO1
C2

12. In condition where the resonance frequency is in RLC parallel circuit, the _____ is bigger as current minimum value.

Dalam keadaan dimana frekuensi resonan dalam litar selari RLC, _____ adalah lebih besar manakala arus adalah minimum.

- A. impedance
galangan
- B. reactance
regangan
- C. capacitance
kemuatan
- D. inductive
induktif

CLO2
C2

13. If the circuit in Figure A13 is at resonance, what is the resonance frequency?

Jika litar seperti Rajah A13 berada dalam keadaan resonan, apakah nilai frekuensi Resonan?

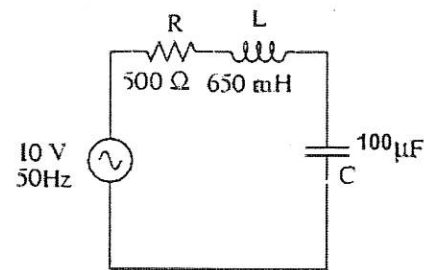


Figure A13/Rajah A13

- A. 122.43Hz
- B. 0.051Hz
- C. 19.74Hz
- D. 19.75kHz

CLO2
C3

10. The Figure A10 below shows a phasor representation of the voltage V across a combination of a resistor and an inductor. Calculate the magnitude and phase of the voltage V .

Rajah A10 di bawah menunjukkan gambaran pemfasa V voltan seluruh gabungan perintang dan pengaruh. Kira magnitud dan fasa voltan V .

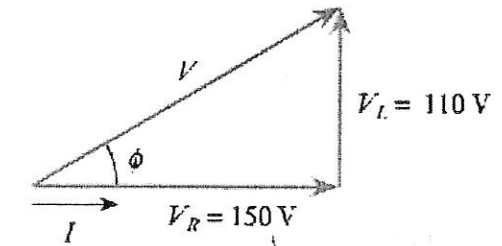


Figure A10/ Rajah A10

- A. The magnitude is 168 V and the phase angle is 54°
Magnitud adalah 168 V dan sudut fasa ialah 54°
- B. The magnitude is 186 V and the phase angle is 54°
Magnitud adalah 186 V dan sudut fasa ialah 54°
- C. The magnitude is 168 V and the phase angle is 36°
Magnitud adalah 168 V dan sudut fasa ialah 36°
- D. The magnitude is 186 V and the phase angle is 36°
Magnitud adalah 186 V dan sudut fasa ialah 36°

CLO2
C3

11. A $20\mu\text{F}$ capacitor in series with 100Ω resistor is connected to an AC source $20 \sin 400t$. What is the capacitive reactance?

Satu kapasitor bernilai $20\mu\text{F}$ dalam keadaan bersiri dengan perintang 100Ω disambungkan kepada sumber AU, $20 \sin 400t$. Apakah nilai regangan kemuatan?

- A. 0.008Ω B. 125Ω
- C. $-j125\Omega$ D. $-j0.008\Omega$

CLO1
C2

16. In a three-phase system having the phase sequence RYB, the voltage of R-phase in zero at particular instants, the magnitude of voltage of Y and B phase at the same instant will be,

Dalam system tiga fasa mempunyai turutan fasa RYB, voltan untuk fasa R berada dalam kedudukan kosong, nilai magnitud voltan fasa Y dan B adalah bernilai,

- A. zero
kosong
- B. maximum
maksimum
- C. 50% of maximum
50% daripada nilai maksimum
- D. 86.86% of maximum
86.86% daripada nilai maksimum

CLO1
C2

17. The core flux in a transformer depends mainly on
Daya magnet teras dalam pengubah bergantung kepada

- A Supply voltage
Voltan bekalan
- B Supply voltage and frequency
Voltan bekalan dan frekuensi
- C Supply voltage, frequency and load
Voltan bekalan, frekuensi dan beban
- D Supply voltage and load but independent of frequency
Voltan bekalan dan beban tanpa bergantung kepada frekuensi

CLO2
C3

14. Referring to the series circuit in Figure A14, find the bandwidth if the resonant frequency is 5kHz

Merujuk kepada litar siri dalam Rajah A14, cari nilai jalur lebar sekiranya frekuensi resonan adalah 5kHz

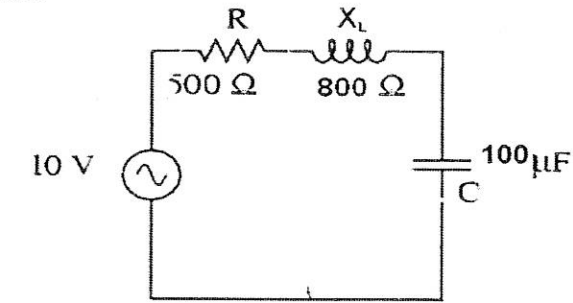


Figure A14/ Rajah A14

- A. 3750Hz
B. 3225Hz
C. 3125Hz
D. 4000Hz

CLO1
C2

15. Choose the advantage of a three phase system over a single phase system:
Pilih kelebihan sistem tiga fasa berbanding dengan sistem satu fasa:

- i. In a balanced three phase system, the conductors need only about 75% of the size of conductors for a single phase two wire system of the same power (KVA) rating.
dalam system tiga fasa seimbang, bahan pengalir yang diperlukan hanyalah 75% daripada saiz pengalir untuk system satu fasa dua dawai untuk kuasa yang sama dipindahkan.
- ii. The efficiency and power factor of single phase motors are much better than three phase motor for the same power transferred.
Motor satu fasa mempunyai faktor kuasa dan kecekapan yang lebih baik dan saiz yang lebih kecil, bagi keluaran yang sama berbanding motor tiga fasa.
- iii. Three phase motor have the ability to 'self start', but not in single phase motor.
Motor tiga fasa adalah kendalian permulaan sendiri tetapi tidak berlaku dalam motor satu fasa.
- iv. Three phase transformer are lighter, cheaper and more efficient compared to a single phase transformer of the same size.
Alatubah tiga fasa adalah lebih ringan, berkecekapan lebih baik dan lebih murah berbanding alatubah satu fasa yang sama saiz.

- A. i dan ii
B. i, iii dan iv
C. ii, iii dan iv
D. i, ii, iii dan iv

SECTION B : 30 MARKS
BAHAGIAN B : 30 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **SEPULUH (10)** soalan berstruktur. Jawab **SEMUA** soalan.

CLO2
C3

QUESTION 1

Write the equation for the sine wave in Figure B1.

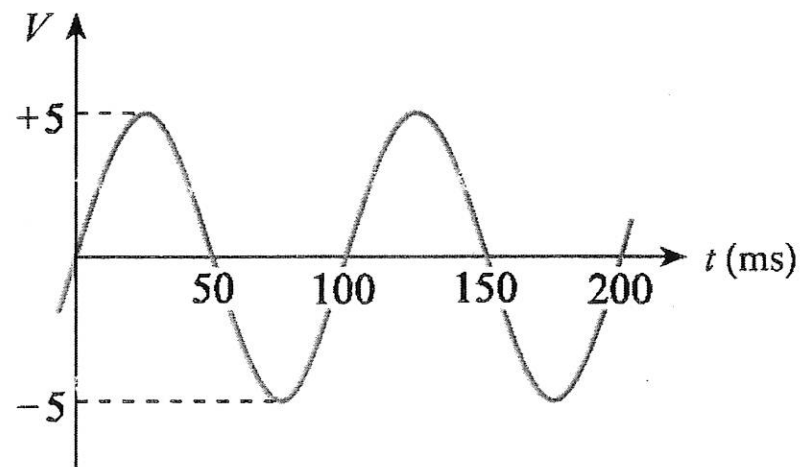


Diagram B1/ Rajah B1

SOALAN 1

Tuliskan persamaan bagi gelombang sinus Rajah B1.

[3 marks]
[3 markah]

CLO2
C2

QUESTION 2

A half-cycle average voltage of 12 V is equal to what rms voltage?

SOALAN 2

Nyatakan nilai persamaan bagi voltan purata setengah kitaran 12 V dengan nilai voltan ppgd?

[3 marks]
[3 markah]

CLO1
C3

18. For a particular transformer, the voltage applied to the primary winding is reduced to half of its rated voltage, whereas the number of turns of this winding is increased to double of its original value. The emf induced in the secondary winding as compared to its rated value will be.....
 untuk sesetengah pengubah, voltan yang dibekalkan kepada lilitan utama berkurang separuh dari nilai voltan, dimana bilangan belitan lilitan dinaikkan kepada dua kali ganda nilai asal. D.G.E yang terhasil pada lilitan sekunder dibandingkan dengan nilai tersebut adalah.....

- A. half
separuh
- B. same
sama
- C. double
dua kali ganda
- D. one-fourth
satu per empat

CLO1
C2

19. A transformer core is laminated to reduce
 Teras pengubah adalah berlapis bertujuan untuk mengurangkan

- A. hysteresis loss
kehilangan histerisis
- B. eddy current losses
kehilangan arus pusar
- C. copper losses
kehilangan tembaga
- D. all the above losses
kehilangan semua di atas

CLO2
C2

20. An ideal transformer is connected to a 230V main and supply at 20V. Calculate the transformer turn ratio.

Pengubah unggul disambungkan kepada 230V, punca utama dan membekalkan 20V. Kirakan nisbah lilitan pengubah

- A. 21.0
- B. 11.5
- C. 19.2
- D. 0.05

CLO1
C1**QUESTION 6**

At the resonance frequency in RLC series circuit is $X_L = X_C$. Write equation for total impedance and sketch the resonance curve of current versus frequency.

SOALAN 6

Pada keadaan frekuensi resonan di litar RLC siri adalah $X_L = X_C$. Tuliskan persamaan galangan dan lakarkan lengkung resonan arus melawan frekuensi.

[3 marks]
[3 markah]

CLO2
C2**QUESTION 7**

With the reference to Figure B7 below, calculate is the bandwidth of the circuit?

SOALAN 7

Berpandukan kepada Rajah B7 di bawah, kirakan jalur lebar untuk litar tersebut.

[3 marks]
[3 markah]

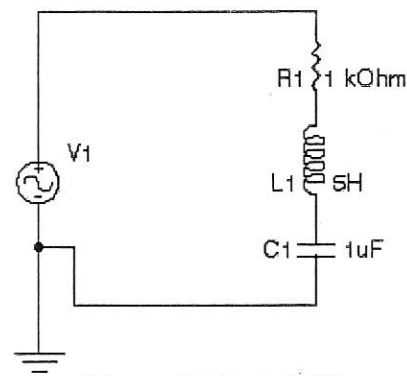


Figure B7/Rajah B7

CLO2
C2**QUESTION 8**

In a certain three-wire star connected generator, the phase voltages are 240V. Calculate the line voltages.

SOALAN 8

Penjana sambungan bintang tiga wayar tertentu, voltan fasanya adalah 240V. Kirakan nilai voltan talian.

[3 marks]
[3 markah]

CLO1
C2**QUESTION 9**

State **THREE** (3) main concepts of a step- down transformer.

SOALAN 9

Nyatakan **TIGA**(3) konsep utama pengubah langkah turun.

[3 marks]
[3 markah]

CLO2
C3**QUESTION 3**

Determine the complex impedance of the following series arrangement shown in Figure B3 at a frequency of 60 Hz.

SOALAN 3

Tentukan nilai impedans kompleks bagi susunan siri dalam Rajah B3 sekiranya frekuensi adalah 60 Hz.

[3 marks]
[3 markah]

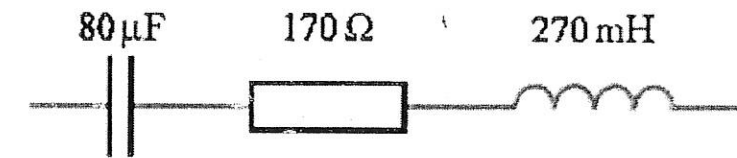


Figure B3/ Rajah B3

CLO2
C3**QUESTION 4**

A sinusoidal current of 5 A peak and 60 Hz flows through a capacitor of 20 mF. What voltage will appear across the capacitor?

SOALAN 4

Arus sinus 5 A puncak dan 60 Hz mengalir melalui kapasitor 20 mF. Kira nilai voltan yang merentasi kapasitor?

[3 marks]
[3 markah]

CLO2
C3**QUESTION 5**

What is the applied voltage for a series RLC circuit when $I_T = 3$ mA, $V_L = 30$ V, $V_C = 18$ V, and $R = 1000$ ohms?

SOALAN 5

Apakah voltan yang diguna untuk litar siri RLC apabila $I_T = 3$ mA, $V_L = 30$ V, $V_C = 18$ V, dan $R = 1000$ ohm?

[3 marks]
[3 markah]

SECTION C : 50 MARKS
BAHAGIAN C : 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** essay questions. Answer **ALL** the questions.

ARAHAN:

Bahagian ini mengandungi **DUA (2)** soalan esei. Jawab **SEMUA** soalan.

QUESTION 1
SOALAN 1

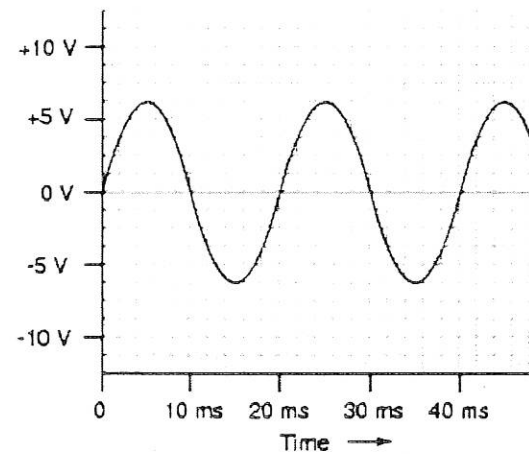
CLO1
C1

- (a) What is the difference between *DC* and *AC* electricity
 Apakah perbezaan diantara *AT* dan *AU* elektrik

[2 marks]
 [2 markah]

CLO2
C1

- (b) By referring to Graph C1 of an AC voltage measured over time:
 Dengan menggunakan Graf C1, kirakan :



Graph C1 / Graf C1

- i. Period
Tempoh
- ii. Angular velocity
Halaju sudut
- iii. Amplitude
Amplitud

[1 mark]
 [1 markah]

[2 marks]
 [2 markah]

[1 mark]
 [1 markah]

CLO2
C2

QUESTION 10

The primary winding of a particular transformer has 200 turns and is connected across a 230V, 50 Hz, single phase supply. If there are 1200 turns in the secondary winding, the voltage across it will be?

SOALAN 10

Belitan utama satu transformer mempunyai 200 pusingan dan disambungkan merentasi 230V, 50Hz, bekalan satu fasa. Jika 1200 pusingan pada belitan sekunder, voltan yang merentasi belitan ini akan menjadi?

[3 marks]
 [3 markah]

QUESTION 2
SOALAN 2

CLO1
C1

- (a) i. Under what conditions will resonance take place in an AC circuit?

Apakah situasi yang menyebabkan resonan akan berlaku di dalam litar AU?

[2 marks]

[2 markah]

CLO2
C2

- ii. A circuit consists of a resistor of 10Ω , an inductor of $0.1H$ and capacitor of $8\mu F$ in series. Calculate the resonant frequency and the voltage across each component when a voltage of $25V$ at resonance frequency is applied to the circuit.

Satu litar mengandungi perintang 10Ω , satu pengaruh, $0.1H$ dan kapasitor $8\mu F$ yang disambungkan secara bersiri. Kirakan frekuensi resonan dan voltan yang merentasi setiap komponen apabila voltan $25V$ pada keadaan frekuensi resonan diaplikasikan kepada litar.

[6 marks]

[6 markah]

CLO1
C1

- (b) i. What are the various ways in which the three phase of a 3-phase system can be properly connect?

Apakah cara penyambungan yang digunakan dalam penyambungan untuk sistem 3 fasa

[2marks]

[2 markah]

CLO2
C3

- ii. A delta connected load draws a current of $15A$ at a lagging power factor of 0.85 from $400V$ 3-phase, 50 Hz supply. Find the resistance of each phase.

Satu sambungan delta membawa arus $15A$ dengan faktor kuasa 0.85 mengekor dari bekalan $400V$ 3-fasa, $50Hz$. Cari nilai perintang di setiap fasa.

[6marks]

[6 markah]

CLO1
C2

- (c) i. What is the relationship between the currents in the primary and secondary windings of transformer?

Hubungkaitkan nilai arus pada bahagian lilitan utama dan sekunder pada pengubah?

[2marks]

[2 markah]

- (c) A series RCL circuit has a 75.0Ω resistor, a $20.0\mu F$ capacitor and a 55.0 mH inductor connected across an 800 volt rms AC generator operating at 128 Hz.

Satu litar siri RCL mempunyai perintang 75.0Ω , $20.0\mu F$ kapasitor dan pengaruh 55.0 mH disambungkan merentasi 800 volt rms penjana AC beroperasi pada 128 Hz.

CLO1
C3

- i. What is the characteristic of the circuit? Is the load on the circuit inductive, capacitive or resistive?

Apakah ciri litar tersebut? Adakah beban di litar induktif, kapasitif atau rintangan

[4 marks]

[4 markah]

CLO2
C2

- ii. What is the phase angle ϕ ?

Apakah sudut fasa ϕ ?

[3 marks]

[3 markah]

CLO2
C2

- iii. What is the rms current in the circuit?

Apakah nilai arus rms dalam litar?

[4 marks]

[4 markah]

CLO1
C3

- iv. Write the formula for the current in the circuit as a function of time.

Tuliskan formula bagi arus dalam litar sebagai fungsi masa

[3 marks]

[3 markah]

CLO2
C2

- v. Find the rms voltage across each circuit element

Kirakan voltan rms bagi setiap elemen litar

[3 marks]

[3 markah]

CLO2
C2

- vi. Find the average power delivered to the circuit by the generator

Kira kuasa purata yang dihantar kepada litar dengan penjana

[2 marks]

[2 markah]

CLO2
C3

ii. An ideal single phase transformer has 2000 windings in its primary coil and 700 windings in its secondary coil. The primary coil is connected to a 240 volt AC, 50Hz. Calculate:

- a. secondary voltage
- b. current in a primary coil if the current in a secondary coil is 5A.

Sebuah pengubah tenaga satu fasa yang mempunyai lilitan pada gelung primer 2000 dan lilitan pada gelung sekunder 700. Gelung primer disambungkan kepada bekalan 240Volt AC, 50Hz. Kirakan :

- a. *Voltan sekunder*
- b. *Arus pada gelung primer jika arus pada gelung sekunder adalah 5A*

[7 marks]

[7 markah]

SOALAN TAMAT