



UNIVERSITI SAINS MALAYSIA

Final Examination  
2016/2017 Academic Session

May/June 2017

**JIF 316 - Electronics II**  
**[Elektronik II]**

Duration : 3 hours  
*[Masa : 3 jam]*

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Please check that this examination paper contains **SEVEN** printed pages before you begin the examination.

Answer **ALL** questions. You may answer **either** in Bahasa Malaysia or in English.

Read the instructions carefully before answering.

Each question carries 20 marks.

In the event of any discrepancies in the exam questions, the English version shall be used.

*Sila semak kertas peperiksaan ini mengandungi **TUJUH** muka surat yang bercetak sebelum anda menjawab sebarang soalan.*

*Jawab **SEMUA** soalan. Anda dibenarkan menjawab soalan **sama ada** dalam Bahasa Malaysia atau Bahasa Inggeris.*

*Baca setiap arahan dengan teliti sebelum menjawab.*

*Setiap soalan bernilai 20 markah.*

*Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.*

Answer ALL questions.

1. (a) Calculate

(i)  $1000_2 - 100_2$

(ii)  $1111_2 \times 1100_2$

(iii)  $43_{16} + 62_{16}$

(iv)  $00010110_{BCD} + 00010101_{BCD}$

(16 marks)

(b) Find the

(i) 1's complement of 11110001

(ii) 2's complement of 10101010

(4 marks)

2. (a) Prove that

(i)  $A + \overline{AB} = A + B$

(ii)  $(\overline{AB} + C)(A + B).C = (A + B)C$

(6 marks)

(b) Apply De Morgan's theorems to the expression

$$\overline{\overline{PQ}(R + \overline{S}) + T}$$

(4 marks)

(c) With the help of De Morgan's theorems, design a simple logic circuit using only NOR gates for the Boolean expression  $Y = (A + B)(B + C)$

(10 marks)

3. (a) For the standard SOP expression

$$X\bar{Y}Z + XY\bar{Z} + \bar{X}YZ + \bar{X}Y\bar{Z} + X\bar{Y}\bar{Z} + XYZ$$

- (i) obtain the binary values.  
 (ii) simplify the expression using a Karnaugh map.

(6 marks)

- (b) Figure 1 shows a Karnaugh map.

	CD	00	01	11	10
AB	00	1			1
01		1	1	1	1
11		1	1		1
10		1		1	1

Figure 1

Obtain the minimum SOP expression.

(4 marks)

- (c) Convert the expression  $(P + \bar{Q})(Q + R)$  to standard POS form.

(5 marks)

- (d) Find the binary values of the variable for which the following POS expression is equal to 0.

$$(A + \bar{B} + C + D)(A + \bar{B} + \bar{C} + D)(\bar{A} + \bar{B} + \bar{C} + \bar{D})$$

(5 marks).

4. (a) Describe the changes of the input and output waveforms that are shown in Figure 2 and identify the logic gate that is responsible to create this output waveform.

(10 marks)

- (b) Show all possible logic levels for this logic gate with the help of a diagram.

(10 marks)

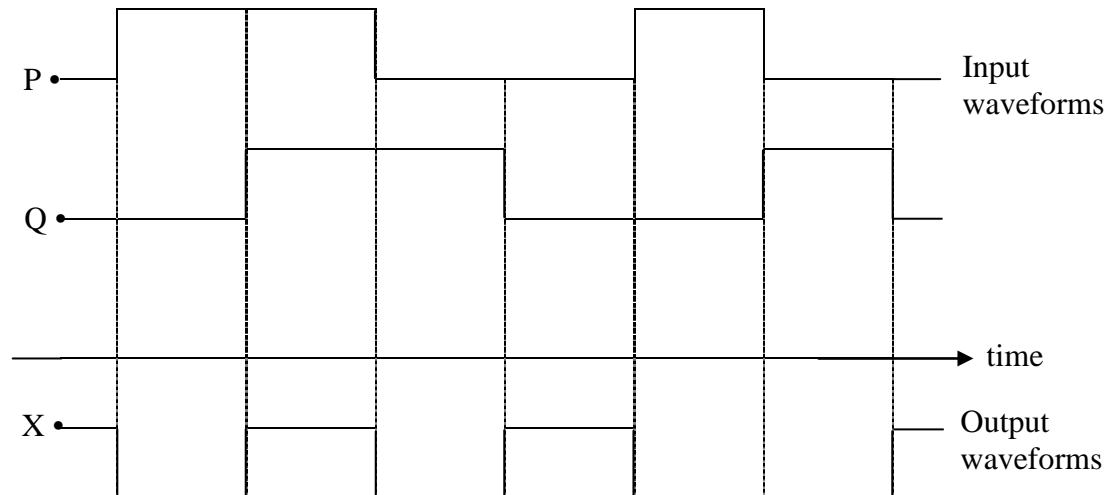


Figure 2

5. (a) (i) Describe how the S-R and D flip-flops work. Your answer should include truth-tables.

- (ii) Why is the D flip-flop sometimes considered a better device than the S-R flip-flop?

(12 marks)

- (b) Describe the operation of basic binary decoder.

(8 marks)

**Jawab SEMUA soalan.**

1. (a) *Hitung*

(i)  $1000_2 - 100_2$

(ii)  $1111_2 \times 1100_2$

(iii)  $43_{16} + 62_{16}$

(iv)  $00010110_{BCD} + 00010101_{BCD}$

(16 markah)

(b) *Cari*

(i) *komplemen 1's untuk 11110001*

(ii) *komplemen 2's untuk 10101010*

(4 markah)

2. (a) *Buktikan bahawa*

(i)  $A + \overline{AB} = A + B$

(ii)  $(\overline{AB} + C)(A + B).C = (A + B)C$

(6 markah)

(b) *Gunakan teorem De Morgan untuk ekspresi*

$$\overline{\overline{PQ}(R + \overline{S}) + T}$$

(4 markah)

(c) *Dengan menggunakan teorem De Morgan, reka bentuk suatu litar logik dengan menggunakan pintu NOR sahaja untuk ekspresi Boolean*

$$Y = (A + B)(B + C)$$

(10 markah)

3. (a) Untuk ekspresi piawai SOP yang berikut

$$X\bar{Y}Z + XY\bar{Z} + \bar{X}YZ + \bar{X}\bar{Y}\bar{Z} + X\bar{Y}\bar{Z} + XYZ$$

- (i) dapatkan nilai-nilai binari.  
 (ii) permudahkan ekspresi tersebut dengan bantuan Peta Karnaugh.

(6 markah)

- (b) Rajah 1 menunjukkan Peta Karnaugh.

AB \ CD	00	01	11	10
00	1			1
01	1	1	1	1
11	1	1		1
10	1		1	1

Rajah 1

Dapatkan ekspresi SOP minimum.

(4 markah)

- (c) Tukarkan ekspresi  $(P + \bar{Q})(Q + R)$  kepada bentuk POS piawai.

(5 markah)

- (d) Cari nilai binari pembolehubah di mana ekspresi POS berikut akan menjadi sifar.

$$(A + \bar{B} + C + D)(A + \bar{B} + \bar{C} + D)(\bar{A} + \bar{B} + \bar{C} + \bar{D})$$

(5 markah)

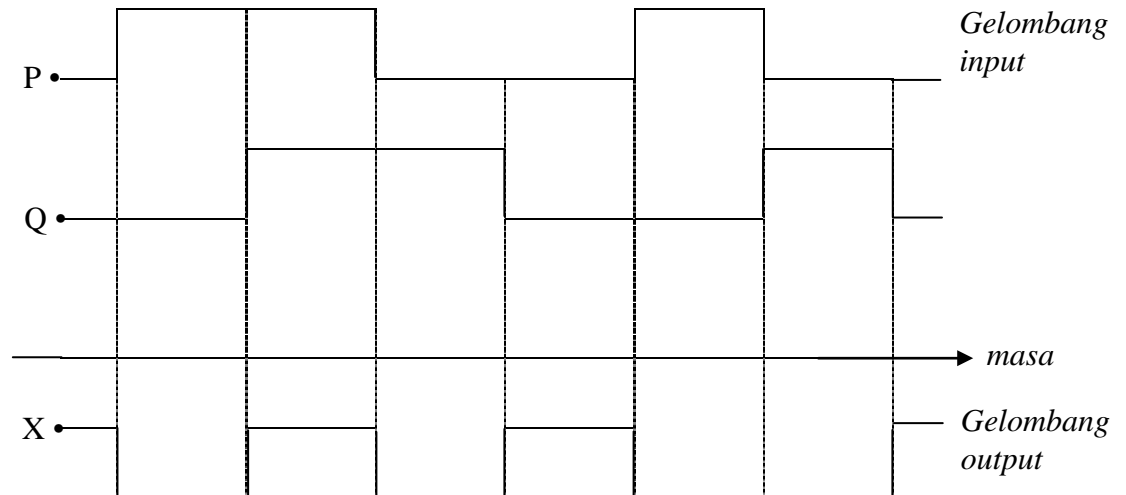
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4. (a) Huraikan perubahan bentuk gelombang input dan output yang ditunjukkan pada Rajah 2. Kenal pasti pintu logik yang bertanggungjawab menjana bentuk gelombang output tersebut.

(10 markah)

- (b) Tunjukkan kesemua paras logik yang mungkin bagi pintu logik tersebut dengan bantuan suatu gambar rajah.

(10 markah)



Rajah 2

5. (a) (i) Huraikan bagaimana flip-flop jenis S-R dan jenis D berfungsi. Jawapan anda harus mengandungi jadual kebenaran.

- (ii) Kenapa flip-flop jenis D kadangkala dianggap lebih baik daripada flip-flop jenis S-R?

(12 markah)

- (b) Huraikan operasi dekoder binari asas.

(8 markah)