Tanta University
Faculty of Engineering
First year
Full mark: 70

Subject: Electrical and electronic materials
Final examination 2008-2009
Time allowed: Three hours
Date: 27/1/2009

part 1: electrical materials (35 Mark)

1-a) Define the following terms: curie temperature, coercive force, relaxation time and magnetic dipole moment (2 marks each)

1-b) Derive an equations to describe the variation of the dielectric constant with frequency using the simplified formula. Assume that $\alpha_0 = 6*10^{-36}$ F m^2 and $N=25*10^{22}$ m^{-3} and calculate the value of the dielectric constant at an angular frequency of $1/\tau$. (5 mark)

1-c) Discuss the principles of the Ionic Polarization. (5 mark)

1-d) Mention some utilizations of the piezoelectricity. (2 mark)

2-a) Calculate the total loss per unit volume in a magnetic circuit at a frequency of 60 Hz. The lamination thickness is 0.4 mm and the resistivity of the core is 600 μΩ.m. Assume that the maximum magnetic flux density is 1.8 tesla and the coercive force is 0.015 A/m. How can you reduce the magnetic loss of this magnetic circuit? (5 mark)

2-b) Compare between the characteristics of diamagnetic and paramagnetic materials. (5 mark)

2-c) Compare between soft and hard magnetic materials and mention the main fields of utilization of each type. (5 mark)

2-d) Mention the main uses of superconductors and discuss the benefits of using them in each field. (5 mark)

Good luck

(Dr. Ahmed Refaat Azmy et al)

(للامتحان جزء ثان)

Tanta University
Faculty of Engineering
Electronics& Communications

1th Year, Time allowed:3Hr.
ELECTRONIC MATERIAL
Date : 27 /01/2009 .

Part (2)

Answer the following questions:

Question 3

a) C omplete the flowing statements:

i- The three types of solid are ….,….,….

ii- Two general classifications of semiconductors are … such as … and … such as ….

iii. GaAs is one of the more common types of the compound semiconductors because……

iv- Crystal lattice is……

v- The *diffusion* process is ……and the *drift* is ……

b) i- Explain with aid of sketches the basic crystal structure types.

ii- Draw the miller planes (236),(110),(111),(100).

c) i- The lattice constant of a face-centered-cubic structure is 4.75 $\mathring{A}$. Calculate the surface density of atoms for (011) and (001) planes.

ii The volume density of atoms for a body centered cubic lattice is $3 \times 10^{22}\ cm^{-3}$ Determine the lattice constant.

iii-The lattice constant of germanium is 5.43 $\mathring{A}$. Calculate the volume density of germanium atoms.

Question 4

a) Explain how the holes contribute in the conductivity.

b) Define the current density hence, write an expression to evaluate its value.

c) Explain what is the meant by the Hall Effect?

d) i- Find the concentration of holes and electrons in the *p type* silicon sample at 300K assuming that resistivity is 0.002Ω.cm.

ii- Repeat (i) for *n type* silicon.

e) Determine the concentration of free electrons and holes at 300K for a silicon sample which has a donor atom concentration of $N_D = 2 \times 10^{14}$ atom/ cm^3 and an acceptor atom concentration of $N_A = 3 \times 10^{14}$ atom/cm^3. where $n_i = 1.5 \times 10^{10}\ cm^{-3}$ at 300k.

f) The sample in part (e) is an (*p* or *n*) type silicon?

Use : $\mu_p = 500\,cm^2/v.s$, $\mu_n = 1300\,cm^2/v.s$ *at 300K*

Good Luck, Prof. M. Nasr

أجب عن الأسئلة الأتية :

السؤال الأول

[١] ماهى أنواع المؤثرات المستخدمة فى لغة فورتران وما وظائفها وما قواعد الأولوية فى تنفيذها؟

[٢] أكتب الشكل العام وارسم خريطة التسلسل واشرح طريقة تنفيذ بلوك العبارات:

IF ..... THEN ..... [ELSEIF ..... THEN] .... ELSE ..... ENDIF

[٣] أكتب المقدار الجبرى الأتى بلغة فورتران موضحاً ترتيب تنفيذ العمليات علما بأن:

$A = 1 \ , \ B = 10 \ , \ C = 16$

$$\text{Quantity} = \text{Log}_e \left(\left| \frac{-B - \sqrt{|B^2 - 4AC|}}{2A} + \text{Tan} \frac{\pi \times A}{2} \right| \right)$$

[٤] ماذا يعنى مصطلح البرمجة المهيكلة؟ وما فائدة استخدامها؟ اذكر أهم هياكل التحكم فى البرامج.

السؤال الثانى

[١] ارسم خريطة التسلسل وأكتب برنامجا لحساب وطباعة المساحة السطحية والحجم لعدد من الكرات يتم إدخال أنصاف أقطارها بطريقة المحادثة مبينا عدد الكرات في آخر التقرير بتنسيقك الشخصي.

[٢] وضح كيف يتم تنفيذ العبارة التالية موضحا الخطأ(إن وجد) :

```
99  IF(VALUE .GE. 0.0 .OR. VALUE .LE. 0.0)  GO TO 99
```

[٣] تحسب استجابة التيار في دائرة كهربية بالمعادلة التالية :

$$i(t) = I_o \times e^{-t/\tau}$$

حيث : شدة التيار بالامبير : i(t) ، التيار الابتدائي بالامبير : I_o

العدد الطبيعي (2.7) : e ، الزمن (ثانية) : t ، الثابت الزمني للدائرة(ثانية) : τ

ارسم خريطة التسلسل وأكتب برنامجا لقراءة المتغيرات I_o , τ , t وحساب استجابة التيار بداية من زمن صفر وحتى زمن t بزيادة مقدارها0.05 وطباعة النتائج بحيث تكون المخرجات كالآتى:

```
          Response of Current
Time(second)  ١٠ مسافات  Current(Amper)
xx.xxx                   0.xxxxxxxESxx
```


(انظر الصفحة التالية)

السؤال الثالث :

[١] بفرض أنه يتم حساب قيمة تذكرة السفر لقطارات السكك الحديدية بشرائح حسب المسافة تبعا للتعريفة التالية :

المسافة (Distance Km)	التعريفة (Tariff E.P.)
30 ≥ Distance	0.90 × Distance
60 ≥ Distance > 30	0.70 × Distance
99 ≥ Distance > 60	0.50 × Distance
Distance > 99	0.40 × Distance

بالاضافة الي مبلغ 1.5 E.P. تأمين و مصاريف ادارية لكل تذكرة.

ارسم خريطة التسلسل وأكتب البرنامج لقراءة الرقم الكودي للمسافر(ID) والمسافة لمجموعة من المسافرين وحساب وطباعة قيمة التذكرة لكل منهم بالاضافة لما يلى:

- يتم حساب عدد المسافرين الاجمالي و المبلغ الاجمالي وطباعتها فى آخر التقرير.
- لإنهاء البرنامج يتم تغذيته بالعدد السالب (99999-).

Report of Tickets

ID Number ← ١١ مسافة → Distance ← ٧ مسافات → Price

xxxx xxxxxx xxx.xx

.....

Total Number of Travelers are xxxx

Total Price is xxxxxx.xx E.P.

[٢] (أ) اكتب برنامجا لحساب وطباعة الوسط الحسابى لمجموعة N من الاعداد الزوجية بإستخدام حلقة DO بحيث:

*يتم ادخال العدد الأول NSTART والعدد الأخير NFINAL بطريقة المحادثة.

*المخرج يطبع منسقا مبينا وظيفة البرنامج والعدد الأول والعدد الأخير والمجموع والوسط الحسابى وعدد مرات التكرار.

(ب) اوجد قيمة كل من المتغيرات YES,VALID, RIGHT بعد تنفيذ العبارات التالية :

```
LOGICAL VALID, RIGHT , YES
VALID = 10.0 .GE. 2.0*5.0
RIGHT = 3.5+4.5 .NE. 2.0*4.0
YES = VALID .AND. RIGHT .OR. VALID .AND. .NOT. RIGHT
```

(ج) كيف يمكن تمثيل حلقات While ، Until ؟ارسم خريطة التسلسل لكل منها وبين أى الحلقات تفضل ولماذا ؟

جامعة طنطا
كلية الهندسة
قسم الفيزيقا والرياضيات الهندسية

المـــــــــادة : رياضيات هندسية (٢) أ
الزمـــــــن :٣ساعات
الفرقـــــــة : أولى كهرباء
تاريخ الإمتحان : ٢٠ /١/ ٢٠٠٩ (الفصل الأول)

Answer the following Questions **[85 Mark]**

Question 1 [40 Mark]

1-a) Solve the initial value problem

$$(\sin x \cosh y)dx - (\cos x \sinh y)dy = 0 \quad , \; y(0) = 0$$

1-b) Solve the following D.E. $(1-xy)dx + (xy - x^2)dy = 0$

1-c) Solve the D.E. $\sec^2 y \frac{dy}{dx} + x \tan y = x^3$

1-d) Find the orthogonal trajectories of the family of the curves $y = c x^2$

1-e) By D-operator Methods fined the general solution of the D.E.

$$y'' + 6y' + 4y = x^2 + 4$$

1-f) Solve $y'' + y = \operatorname{cosec} x \cot x$

1-g) Find the solution of the D.E.

$$x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = \ln x \quad , y(1) = 0 \, , \, y'(1) = 0$$

Question 2 [45 Mark]

2-a) If $u = u(x, y)$, $x = r\cos\theta$, $y = r\sin\theta$ prove that

$$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 = \left(\frac{\partial u}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial u}{\partial \theta}\right)^2$$

2-b) If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, show that $x.\frac{\partial u}{\partial x} + y.\frac{\partial u}{\partial y} = \tan u$

2- c) Obtain Taylor's expansion of $\tan^{-1}\left(\frac{y}{x}\right)$ about $(1,1)$ up to and including the second degree terms

2-d) If $\int_0^{\pi} \frac{dx}{\alpha - \cos x} = \frac{\pi}{\sqrt{\alpha^2 - 1}}$ prove that

$$(i) \int_0^{\pi} \frac{dx}{(\alpha - \cos x)^2} = \frac{\pi\alpha}{(\alpha^2-1)^{3/2}} \qquad (ii) \int_0^{\pi} \frac{dx}{(2 - \cos x)^2} = \frac{2\pi}{3\sqrt{3}}$$

2-e) Find $\iint_D \sqrt{x^2+y^2}\, dx\, dy$ where D is the region bounded by

$x^2 + y^2 = 4$, $x^2 + y^2 = 9$

2-f) Use Green's Theorem to evaluate $\oint_c 2xy\, dx + (x^2+y^2)dy$

where c is the ellipse $4x^2 + 9y^2 = 36$

2-g) Evaluate the volume of the region bounded by

$x^2 + y^2 + z^2 = 2z$, $x^2 + y^2 = z^2$

Logic Design Exam
Time allowed: 3hrs

Tanta University- Faculty of Engineering
Computers and Automatic Control Dept

Question (1)

a- Simplify the following Boolean functions, using Karnaugh maps:

(i) $F(X,Y,Z) = \sum (0,1,2,5.7)$

(ii) $F(A,B,C) = A`B + AC` + B`C`$

(iii) $H(A,B,C,D) = \sum (1,7,12,14,15)$, don't care $= \sum(0,3,4)$

b- Specify the basic idea of multiplexer. Then can you design a circuit that adds two 4-bit numbers B or C to a third number A using 4-bit full adder and a multiplexer. (we need to add A+C or A+B according to a given choice signal).

Question (2)

a- Decoder/encoder, multiplexer/demultiplexer are two opposite pairs. State the function of each of the four circuits then specify how each pair is used with its opposite in the real life application.

b- Implement the following functions using a decoder: $F(A,B,C) = \sum(1,5,6,7)$
Can you use a demultiplxer to implement the same function and how?

Question (3)

a- State the steps involved in designing any combinational circuit.

b- Design a combinational circuit that adds 5 to a 4-bit binary number if this number is less than 7 and do nothing if the number is equal to or greater than 7.

c- Design a combinational circuit that operates a fan and close the door when the degree in the room reaches 25 degrees and the light is on. The inputs to the circuit is the sensor from the light indicating whether it is on or off and the sensor of heat indicating the degree is below 25 or not. Draw the block diagram first then make the design.

Question (4)

a- What is the difference between shift-right register and shift-right-circulate register. Explain your answer on a 4-bit registers of both kind assuming that the initial values stored in each register is (1100). Make four shifts and show the contents of the registers after each shift.

b- Make a design of a circuit that has 4-bit register and a combinational circuit that checks the values stored in the register. If this value is (1001), the combinational circuit should send a clear signal to all the bits of the register to make them all (0000). Draw the circuit and explain.

Good Luck all,
Dr. Amany Sarhan

Tanta University
College of Engineering
Electronics & Comm. Eng. Dept

First year
Electronics 1 – 3 h
Jan 2009

Answer the following questions

Q1. (a) Derive an expression for the built in potential in terms of junction parameters.

(b) A diode operates in the forward bias region, If we wish to increase the current by a factor of 5 . How much change in V_D is required

(c) What is the change in the built – in potential of a p-n junction at 300 K when the doping on the n-side is changed by a factor of 1000 and the doping on the p-side remains constant. Explain your results.

Q2. (a) Describe the operation of the bridge rectifier circuit with an RC filter. Draw the output voltage waveform, and explain how can the magnitude of the ripple voltage be reduced

(b) In each of the ideal diode circuits shown in **Fig.1**, if v_I = 10 V peak sine wave .Sketch the resulting output waveform. What are its positive and negative peak values.

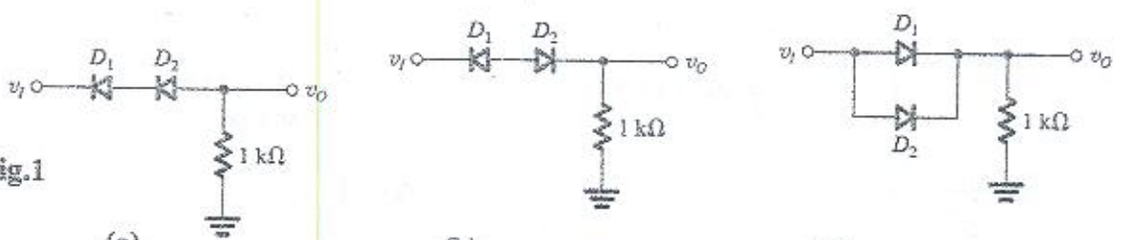

Fig.1

(c) Design limiter circuits using only diodes and resistors to provide an output signal limited to the range :
(i) - 0.7 and above (ii) - 2.1 and above (iii) ± 1.4 V
Assume that each diode has a 0.7 V drop when conducting

Q3. (a) Describe the basic operation of a transistor biased for active region operation.

(b) In the circuit shown in **Fig.2** , determine the maximum value of V_B that places Q_1 at the edge of saturation. Assume Is = 3 x 10 $^{-16}$ A.

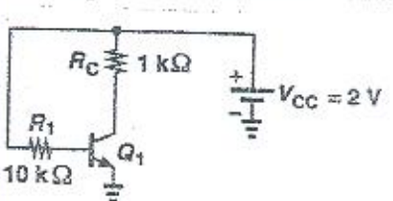

Fig.2

(c) In the circuit shown in **Fig.3** , Is = 5 x 10^{-17} A .Determine V_x for
(i) $V_A = \infty$ and (i) $V_A = 5$ V

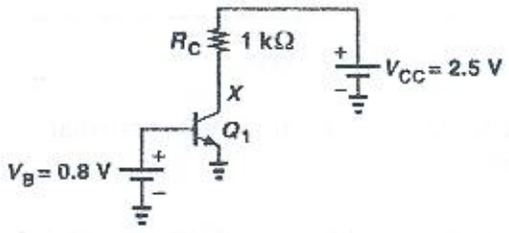

Fig.3

Q4. (a) In the circuit shown in **Fig .4** , Is = 6 x 10^{-16} A and $V_A = \infty$
(i) Determine V_B such that Q_1 operates at the edge of the active region
(ii) If we allow soft saturation (V_{CB} = 200 mV) , by how much can V_B increase ?

(b) We wish to design the CE stage shown in **Fig.5** for a voltage gain of 20. What is the minimum allowable supply voltage if Q1 must remain in the active mode ? Assume $V_A = \infty$ and V_{BE} = 0.8 V

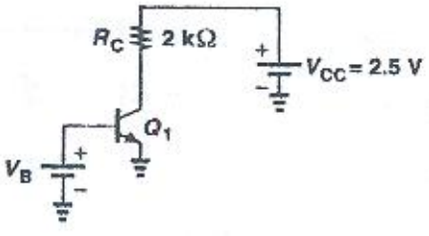

Fig.4

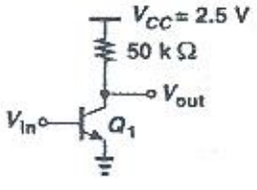

Fig.5

Good Luck.....

Tanta University
Faculty of Engineering
First year
Full mark: 70

Subject: Electrical and electronic materials
Final examination 2008-2009
Time allowed: Three hours
Date: 27/1/2009

part 1: electrical materials (35 Mark)

1-a) Define the following terms: curie temperature, coercive force, relaxation time and magnetic dipole moment (2 marks each)

1-b) Derive an equations to describe the variation of the dielectric constant with frequency using the simplified formula. Assume that $\alpha_0 = 6*10^{-36}$ F m^2 and $N=25*10^{22}$ m^{-3} and calculate the value of the dielectric constant at an angular frequency of $1/\tau$. (5 mark)

1-c) Discuss the principles of the Ionic Polarization. (5 mark)

1-d) Mention some utilizations of the piezoelectricity. (2 mark)

2-a) Calculate the total loss per unit volume in a magnetic circuit at a frequency of 60 Hz. The lamination thickness is 0.4 mm and the resistivity of the core is 600 μΩ.m. Assume that the maximum magnetic flux density is 1.8 tesla and the coercive force is 0.015 A/m. How can you reduce the magnetic loss of this magnetic circuit? (5 mark)

2-b) Compare between the characteristics of diamagnetic and paramagnetic materials. (5 mark)

2-c) Compare between soft and hard magnetic materials and mention the main fields of utilization of each type. (5 mark)

2-d) Mention the main uses of superconductors and discuss the benefits of using them in each field. (5 mark)

Good luck

(Dr. Ahmed Refaat Azmy et al)

(للامتحان جزء ثان)

اولى كهرباء

Tanta university	**Final Term Exam**
Faculty of engineering	**First Year**
Electrical Power and Machine Dept.	**2008-2009**
A Course of Electric Circuits (1)	**Allowable Time: 3 H**

Solve The Following Questions

1) For the circuit shown in Figure (1), (a) find I_s, I_1, I_2 and I_3; (b) repeat (a) if R_1 is short circuited; (c) repeat (a) if R_1 is open circuited. **(15 Marks)**

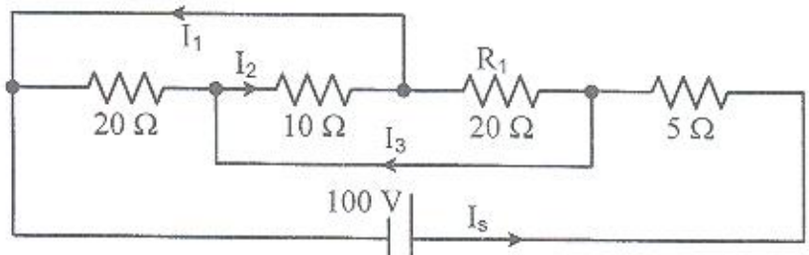

Figure (1)

2) For the circuit shown in Figure (2): **(15 Marks)**

(a) Write down the loop current equations;

(b) Solve for mesh current.

(c) Find V_1 and V_2.

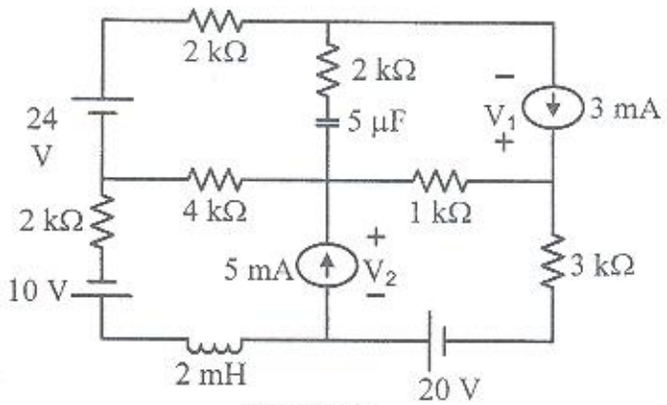

Figure (2)

3- a) For the circuit shown in Figure (3), find value of Z_L to absorbed maximum power from the network then evaluate maximum power to Z_L. **(25 Marks)**

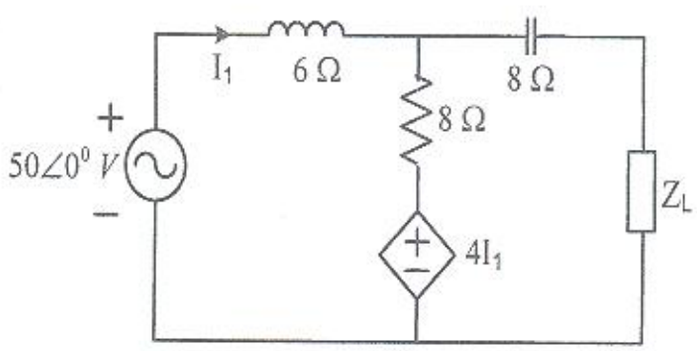

Figure (3)

3- b) For the circuit shown in Figure (4), find the sinusoidal expression of i_L if $e = 50\sin(314t + 30^0)\ V$ and $i = 10\sin(377t + 60^0)\ V$

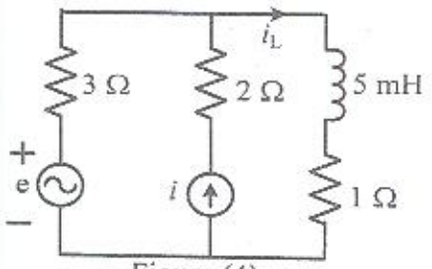

Figure (4)

4- a) For the circuit shown in Figure (6), Find: (i) the total number of watts, the total number of VAR, the total number of VA and input power factor (ii) sketch power triangle; (iii) what is the parallel capacitor required to improve circuit power factor to 0.95 lagging?; (iv) find the percentage change in supply current.

(20 Marks)

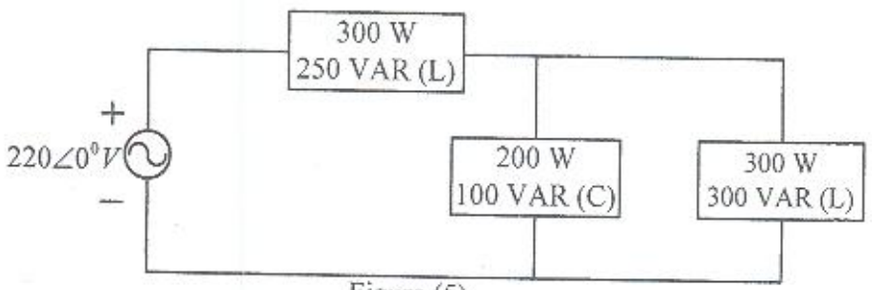

Figure (5)

4 -b) Determine the admittance parameters of the network shown in Figure (6).

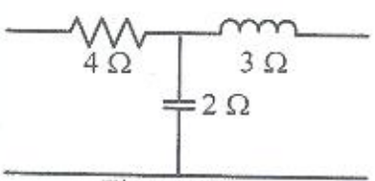

Figure (6)

5) For series resonant circuit of Figure (7), (a) find the circuit capacitor for resonance frequency of 50 kHz and coil resistance for circuit quality factor of 50; (b) the circuit bandwidth; (c) the minimum output voltage, cutoff frequencies; (c) sketch the output voltage versus frequency.

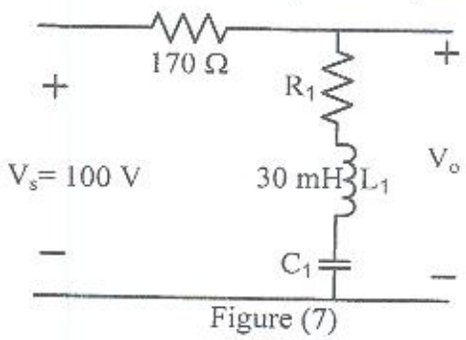

Figure (7)

(15 Marks)

(With Our Best Wishes)

Dr. Fayza Safan & Dr. Ibrahim Bedir