University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring – 2016
Program: B. Sc Engineering (CSE) (1st Year/ 2nd Semester)

Course Title: Physics II | Course Code: PHY-103 | Credit: 3.00
Time: 3.00 Hours | Full Mark: 150

[N.B- The figures in the right margin indicate marks. There are **EIGHT** *questions. Answer any* **SIX**.*]*

1. (a) Prove that the wavelength of the group wave in electromagnetism is given by **[20]**

$$\lambda_g = \frac{\lambda}{\sqrt{1-\left(\frac{\lambda}{2a}\right)^2}}$$

(b) Find the width "a" of a rectangular wave-guide whose wavelength is 4.5 cm and has a velocity V which is 75% of the speed of light. **[5]**

λ

2. (a) State and explain Biot and Savart law. Find out the magnetic flux density **B** of a long infinite wire, which is carrying a current I. **[20]**

$B = \frac{\mu_0 I}{2\pi y}$

(b) A circular coil of diameter 4.5 cm, it has 4000 turns and 2.5 ampere of current is flowing through it. Find out the magnetic field **B** at the centre of the coil. **[5]**

3. (a) What is called terrestrial magnetism? State and explain Maxwell's equations of electromagnetic waves. **[15]**

(b) A circular ring of iron has a cross sectional area of 5.00 cm^2, an average diameter of 30 cm and is wound with a coil of 1000 turns. A current of 3 ampere in the coil magnetizes the iron so that its relative permeability is 250. What is the flux. **[10]**

4. (a) What is called Einstein's general and special theory of relativity? Write down two postulates and six observations of Einstein's special theory of relativity. **[20]**

(b) An electron is moving with a speed of 0.95 C in a direction opposite to that of a moving photon, calculate the relative velocity of the electron with respect to the photon. **[5]**

5. (a) What is called Compton effect? Prove that $\Delta\lambda = \frac{h(1-\cos\theta)}{m_0 c}$, where the terms have their usual meanings. [15]

(b) X-rays of wavelength 0.6 Å scattered from a block of carbon are viewed at an angle of 90^0 to the incident beam. Find the kinetic energy of the recoil electron. [10]

6. (a) What do you mean by LASER and MASER? How can you produce LASER from Ruby crystal? And also mention some uses of LASER. [15]

(b) A laser beam λ= 6000 Å on earth is focused by a lens (or mirror) of diameter 2 m on to a crater on the moon. The distance of the moon is 4×10^8 m. How big is the spot on the moon? Neglect the effect of earth's atmosphere. [10]

7. State and explain the spontaneous and stimulated emission, emitted from an excited atom. And also calculate the Einstein's coefficients A and B from it. [25]

8. (a) Give a brief description about Fibre optics, which is now widely used in the communication technology and also give some uses of it. [15]

(b) The coherence length for sodium light is 2.945×10^{-2} m. The wavelength of sodium light is 5890 A^0. Calculate (i) the number of oscillations corresponding to the coherence length and (ii) the coherence time. [10]

University of Asia Pacific

Department of Computer Science and Engineering

Semester Final Examination, Spring- 2016

Program: B. Sc Engineering (1^{st} Year/ 2^{nd} Semester)

Course Title: Discrete Mathematics Course No CSE 105 Credit: 3.00

Time: 3.00 Hours. Full Mark: 150

There are **Eight** Questions. Answer any **Six**. All questions are of equal value/Figures in the right margin indicate marks.

1. a) Let R1 be the "less than" relation on the set of real numbers and let R2 be the "greater than" relation on the set of real numbers, that is, R1 = {(x, y) | x < y} and R2 = {(x, y) | x > y}. What are R1 ∪ R2, R1 ∩ R2, R1 − R2, R2 − R1, and R1 ⊕ R2? 10

   b) Find the zero-one matrix of the transitive closure of the relation R where 15

$$M_R = \begin{vmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{vmatrix}$$

2. a) Determine and explain with reasons whether each of the following functions from R into R is one-to-one or onto or invertible: 15

   i. $f(n) = n - 1$

   ii. $f(n) = 1+n$

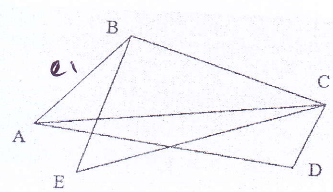
   iii. $f(n) = n^3$

   iv. $f(n) = |n| + 1$

   v. $f(n) = \lceil n/2 \rceil$

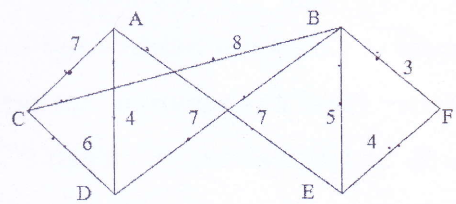
   b) Let A={a,b,c}; B={1,2,3}; C={w,x,y,z}; D={4,5,6} and the functions f: A→B, g: B→C, and h: C→D are determined as f={(a,2), (b,1), (c,2)}, g ={(1,y), (2,x), (3,w)} and h ={(x,4), (y,6), (z,4), (w,5)}. Find the composition function $h_o g_o f$ 10

3. a) Consider the graph G in the following figure. (i) Find the set of vertices V(G) and the set of edges E(G). (ii) Find the degree of each vertex and iii) Verify the theorem "The sum of the degrees of the vertices of the graph is equal to twice the number of edges in G." 10



   b) Give the memory representation of the above graph. 15

4. a) Find two different minimum spanning trees from the below graph G. 25



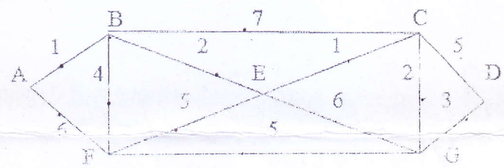
5. a) Using the Pigeon Hole Principle to solve the following problem: 5
Find the minimum number of students needed to guarantee that five of them belong to the same class (e.g. Freshman, Sophomore, Junior, Senior).

b) A bag contains six white marbles and five red marbles. Find the number of ways four marbles can be drawn from the bag if two must be white and two red. 8

c) State the converse, contrapositive and inverse of each of the following implications: 12

   i. If it snows today, I will ski tomorrow.
   ii. I come to class whenever there is going to be a quiz.

6. a) Suppose a graph G in Fig. 3. Find the shortest path in below graph from vertex A to vertex G. using the shortest path algorithm. 15



b) Suppose A and B are playing a tennis tournament such that the first person to win two games consecutively or who wins a total of three games wins the tournament. Find the number of ways the tournament can proceed. 10

7. a) Represent the following algebric representation using binary tree: ((a+b)(c+d))-(e+f)/h+g 10

b) Given a memory representation of binary tree as follows: 15

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
info	g	a	h		i	b	j	c		k	d		e	l	f	m	n		
left	10	6	16	9	0	11	17	15	12	0	0	18	5	0	0	0	0	19	0
right	14	8	0		0	13	0	1		0	3		0	0	7	0	0		

Root=2; Avail=4

   i) Draw the diagram of the tree.
   ii) Find the preorder, in-order and post-order traversals.

8. a) Using Binomial Coefficient to prove that $= \binom{n+1}{r} = \binom{n}{r-1} + \binom{n}{r}$ 15

b) State the converse, contrapositive, and inverse of each of the following implications: 10

   i. If it snows tonight, then I will stay at home.
   ii. I go out today if it is a sunny summer day.

University of Asia Pacific
Department of Computer Scienceand Engineering
Semester Final Examination, Spring - 2016
Program: B. Sc Engineering (1st Year /2nd Semester)

Course Title: Basic Electrical Engineering Course Code: ECE 101 Credit: 3.00
Time: 3.00 Hours Full Marks: 150

*[There are **eight** questions. Answer any **six**. Figures in the right margin indicate marks]*

1. (a) State Ohm's law with proper explanation [05]
   (b) Find the power delivered to an element at $t = 3\ ms$ if the current entering its positive terminal is $i = 5\ cos 60\pi t\ A$ and the voltage is $v = 3\ di/dt$ [10]
   (c) A homeowner consumes 400 kWh in January. Determine the electricity bill for the month using the following residential rate schedule: [10]

Base monthly charge of $12.00
First 100kWh per month at 16 cents/kWh
Next 200kWh per month at 10 cents/kWh
Above 300kWh per month at 6 cents/kWh

2. (a) State KVL and KCL [08]
   (b) Find $i_{8\Omega}$ from Fig. 2(b) using node analysis [10]
   (c) Find Reqfrom Fig. 2(c) [07]

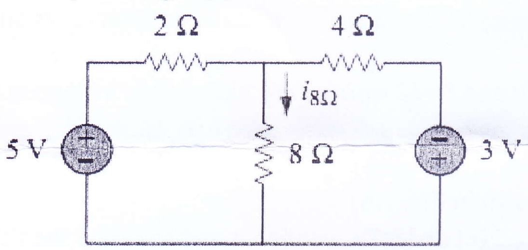


Fig. 2(b)

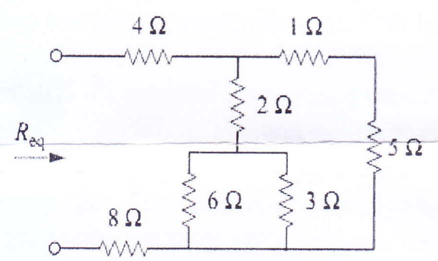


Fig. 2(c)

3. (a) Find V_1, V_2, i_1, $i_2$from Fig. 3(a). Find the dissipated power in 12Ω& 40Ω resistors. [10]
   (b) Determine i_1 and $i_2$from the circuit shown in Fig. 3(b) [07]
   (c) Find V_0 and $I_0$from the circuit shown in Fig. 3(c) using mesh analysis [08]

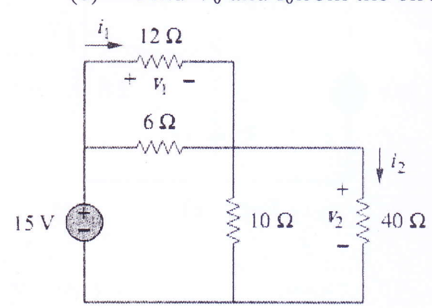


Fig. 3(a)

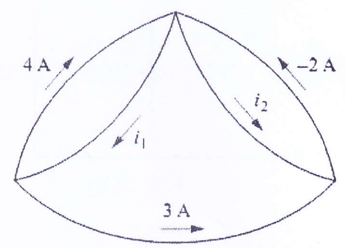


Fig. 3(b)

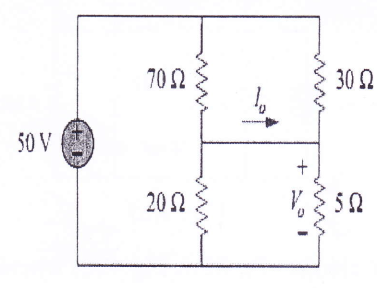


Fig. 3(c)

4. (a) State superposition theorem. Determine $V_0$from Fig. 4(a) using superposition theorem. [13]
   (b) State Thevenin's theorem. Find Thevenin's equivalent circuit for the circuit shown in 4(b). Als determine i. [12]

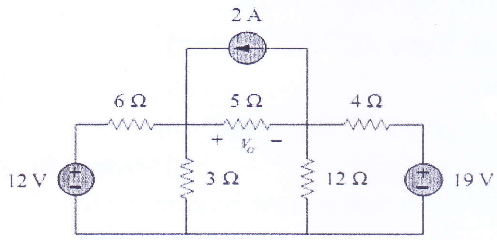


Fig. 4(a)

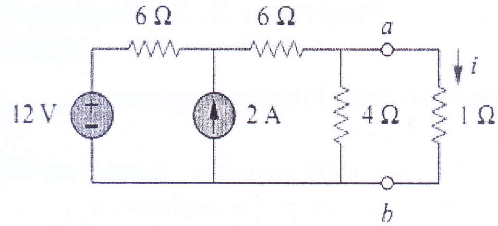


Fig. 4(b)

5. (a) State maximum power transfer theorem. Also derive the equation of maximum power. [10]

(b) Find the value of R_L for maximum power transfer from the circuit shown in Fig. 5(a). Also find maximum power. [15]

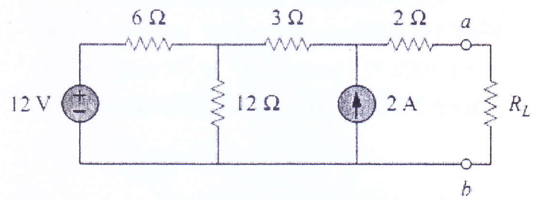


Fig.5(a)

6. (a) What is the difference between DC and AC current? [05]

(b) Find the amplitude, phase, period and cyclic frequency of the following sinusoid voltage equation. [10]
$V=10\cos(3\pi t-50)$

(c) Calculate phase angle between $V=-10\cos(\omega t+500)$ and $I=12\sin(\omega t-100)$.Sketch it in a diagram to show the phase relationship. Which sinusoid is leading? [10]

7. (a) Find the energy stored in each capacitor under dc condition from Fig. 7(a) [10]

(b) Find equivalent capacitance $C_{eq}$from the circuit shown in Fig. 7(b) [10]

(c) Determine i, V_c and $i_L$from the circuit shown in Fig. 7(c) under DC condition and calculate the energy stored in the capacitor and inductor. [05]

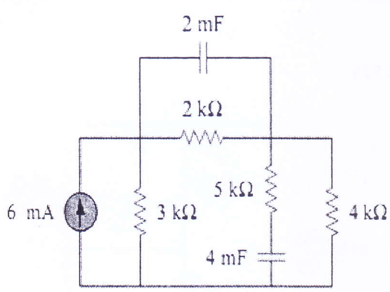


Fig. 7(a)

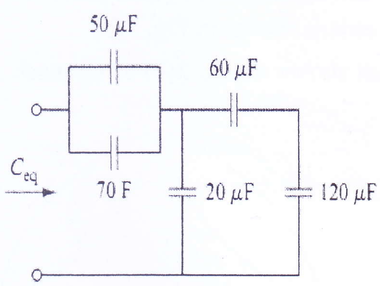


Fig. 7(b)

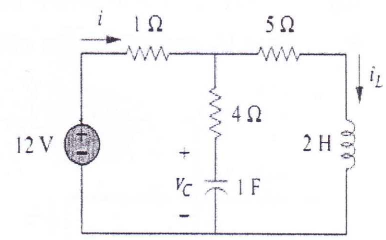


Fig. 7(c)

8. (a) Calculate Z_{in} from Fig. 8(a) whereangular velocity is 10 rad/s. [10]

(b) Calculate V_o as indicated in the following Fig. 8(b). [11]

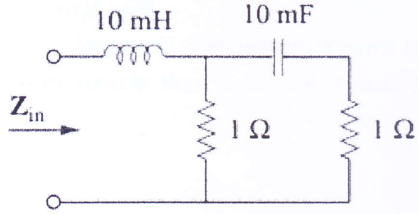


Fig. 8(a)

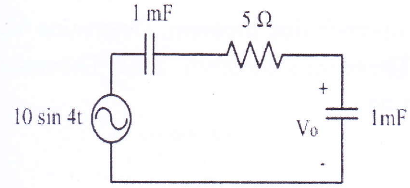


Fig. 8(b)

(c) Define i) Power factor ii) Reactive power [04]

University of Asia Pacific
Department of Computer Science & Engineering
Semester Final Examination, Spring - 2016
Program: Bachelor of Computer Science & Engineering

Course Code: HSS 103	Course Title: English Language ii	Course Credit: 3.00
Total Marks: 50		Total Time: 3.00 Hours

1. Read the following passage and answer the questions that follow: **5**

Athena was the goddess of wisdom. She could get angry, but more typically, she was wise, and kind, and understanding. Athena was born very oddly. Her father was the mighty Zeus. But she did not have a mother. Instead, as the myth goes, she was born directly out of Zeus' brain. Zeus loved all his children. But one of his favorites was Athena.

Here is a myth about Athena that shows how clever and practical she was.

Nearly every town in ancient Greece had a god that looked after the townspeople. Towns rarely had more than one god to keep an eye on their best interests. Most gods did not share well. So usually, it was one town and if the town was lucky, one god to watch over it.

Poseidon loved watching over towns. He usually picked coastal towns since he was the Lord of the Sea. Poseidon was a very powerful god. His brothers were Zeus and Hades. Poseidon was a moody fellow, but he loved his wife and children and he loved attention. He liked having people build temples in his honor and bring him gifts. They were not very useful gifts for a god, but he enjoyed getting them anyway. As Greece grew and developed, new towns sprang up all the time. Poseidon was always on the lookout for new coastal towns.

He was not the only god who loved to be in charge. Athena, along with other gods, enjoyed that role as well. One day, both Athena and Poseidon claimed a new village.

Most of the time, humans were grateful when they were selected to be under the care of a god. But two gods? That was one too many. Poseidon wanted them to choose which god they wanted. But the people did not want to choose. They could see only trouble ahead if they did.

Athena, goddess of wisdom, daughter of Zeus, understood their worry. She challenged her uncle Poseidon to a contest. Both gods would give the town a gift. The townspeople could decide which gift was the more useful.

Poseidon slapped his specter against the side of the mountain. A stream appeared. The people were excited. A source of fresh water was so important! But when they tried to drink the water, they discovered it was not fresh at all. It was salt water!

Athena waved her arm and an olive tree appeared. The people nibbled at the olives. They were delicious! The people were excited. The olive tree would provide wood for building homes. Branches would provide kindling for kitchen stoves and fireplaces. The olives could be used for food. The fruit could pressed to release cooking oil. It was wonderful.

But theirs was a coastal village. The people could not risk angering the Lord of the Sea, the mighty Poseidon. As it turned out, they did not have to choose. Poseidon chose for them. He laughed his mighty laugh, sending waves crashing against the shoreline. Poseidon proclaimed his niece the winner!

That's how a small village gained a most powerful and wise guardian, the goddess Athena, a guardian who helped them rise to fame. In her honor, they named their village Athens.

a) How was Athena born?

b) Who is Poseidon?

c) What was the competition about?

d) What stopped the people of the town from choosing?

e) How did Athena win the competition?

2. Fill in the blanks: You may use and change the given words if needed (could, should, may, might, dare, need) 5

a) He ____________ have made some mistakes.

b) Kamal ________________ have ordered the furniture before moving in.

c) He _________________ ask for a raise for the fear of losing his job.

d) We _________________ wash our cycle every day.

e) Selim _________________ been able to overcome the situation on his own.

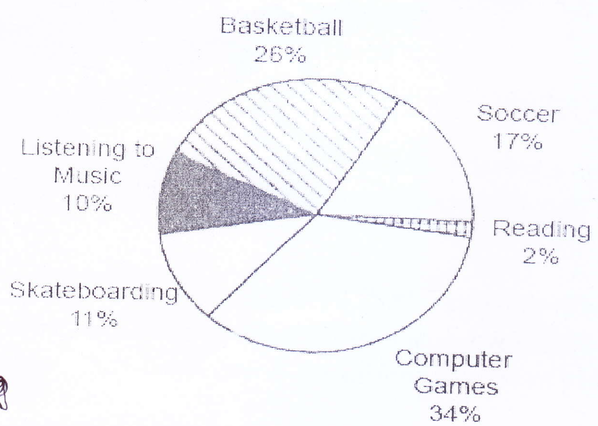
3. Write a memorandum to the director of a company reporting to him about the transportation problem faced by the employees of the company. 6

4. Write the review of a film/book which you recently enjoyed.(200 Words) 8

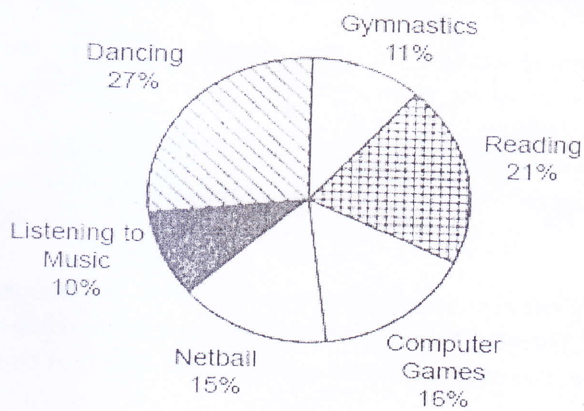
5. A cultural program was held at the University of Asia Pacific for the new students getting admitted from the new semester. Write a newspaper report on the program. (150 Words) 8

6. The graph below shows the differences between the activities of boys and girls. Summarize the information by selecting and reporting the main features, and make comparisons where relevant. (150 Words) 8

Boys' Cultural and Leisure Activities



Girls' Cultural and Leisure Activities



7. Write an essay on any of the following topics: (300 Words) 10

a) Should schools have uniforms for its students?

b) Discuss the effects of the continued destruction of our forests.

c) Should students be allowed to evaluate their teachers?

d) The effect of social media on family relationships.

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring - 2016
Program: B. Sc. Engineering (Computer Science)
(1st Year/ 2nd Semester)

Course Title: Math II: Calculus | Course Code. MTH 103

Time: 3.00 Hours | Full Mark:150

N.B: There are **Eight** questions. Answer any **Six (6)** of the following:

1. (a) Find the equation of the tangent plane and normal line to the surface $x^2 + y^2 = z$ at the point $(2, -1, 5)$ **15**

   (b) Find the following Limits: **5+5**

   (i) $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x} - 2\ln(1+x)}{x \sin x}$ (ii) $\lim\limits_{x \to \frac{\pi}{2}} (\sec x - \tan x)$

2. (a) State Euler's theorem. Verify Euler's theorem for the function **15**
   $u = x^2 \ln\left(\dfrac{y}{x}\right)$

   (b) If $u = \sin^{-1}\dfrac{y}{x} + \tan^{-1}\dfrac{x}{y}$, then show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 0$ **10**

3. (a) Find the maximum, minimum value and the inflection point of the function **17**
   $$f(x) = 2x^3 - 6x^2 - 18x + 7$$
   Also show that the inflection point is the middle point of the maximum and minimum points.

   $x = \cos\theta$

   (b) Find $\dfrac{dy}{dx}$ if $y = \sin 2\tan^{-1}\sqrt{\dfrac{1-x}{1+x}}$ **8**

4. (a) Evaluate $\iint\limits_R (x+y)\,dxdy$ by making the change of variables, where R is the region enclosed by the lines $x = 0$, $x + y = 2$, $y = 0$ and $x + y = 3$. **17**

   (b) If R be a region bounded by $x = 1, x = 4, y = -1$ *and* $y = 2$, then evaluate $\iint\limits_R (2x + 6x^2 y)\,dydx$ **8**

5 (a) Define improper integrals. Evaluate the improper integrals **3+6+6**

(i) $\int_0^{\infty} \frac{x\,dx}{x^4+1}$ (ii) $\int_0^1 \frac{lnx dx}{\sqrt{x}}$

(b) Define Gamma and Beta Function. Show that **10**

$$\int_0^{\frac{\pi}{2}} \sin^4\theta \cos^6\theta \, d\theta = \frac{3}{512}\pi$$

6 (a) Evaluate: **7+7+6**

(i) $\int \sqrt{\frac{x}{a-x}}dx$ (ii) $\int (\ln\sqrt{x})^2 dx$ (iii) $\int x^3 e^x dx$

(b) State Second fundamental theorem of Calculus. **5**

7 (a) Evaluate the definite integral **10**

$$\int_0^2 \frac{dx}{4+3\sin x}$$

(b) By the method of substitution evaluate the following integrals **5+5+5**

(i) $\int \frac{e^x dx}{e^{2x}+2e^x+5}$

(ii) $\int \frac{dx}{\sqrt{2ax-x^2}}$

(iii) $\int \sin x \cos x dx$

8 (a) Establish a reduction formula for $\int x^n e^{ax}\,dx$ and find $\int x^2 e^{ax}\,dx$. **15**

(b) Find the area of the region that is enclosed between the curves $y = x^2$ and $y = x + 6$. **10**