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A

موسسه آموزش عالی آزاد



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نام:

نام خانوادگی:

محل امضاء:

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سازمان سنجش آموزش کشور

اگر دانشگاه اصلاح شود مملکت اصلاح می‌شود.
امام خمینی (ره)

آزمون ورودی دوره‌های کارشناسی ارشد ناپیوسته داخل – سال ۱۳۹۲

مجموعه مهندسی – برق کد ۱۲۵۱

ردیف	مواد امتحانی	تعداد سؤال	از شماره	تا شماره
۱	زبان عمومی و تخصصی	۳۰	۱	۳۰
۲	ریاضیات (معادلات دیفرانسیل، ریاضیات مهندسی، آمار و احتمالات)	۱۲	۳۱	۴۲
۳	مدارهای الکتریکی ۱ و ۲	۱۲	۴۳	۵۴

بهمن ماه سال ۱۳۹۱

استفاده از ماشین حساب مجاز نمی‌باشد.

Part A: Vocabulary

Directions: Choose the word or phrase (1), (2), (3), or (4) that best completes each sentence. Then mark the correct choice on your answer sheet.

1- We can the power of the wind to generate electricity.

- 1) harness 2) justify 3) engender 4) obey

2- The discovery of DAN's double-helix structure by James D. Watson and Francis H.Crick reduced genetics to chemistry and laid the for the next half a century of biology.

- 1) resources 2) spheres 3) distributions 4) foundations

3- Does some fine madness plague great artists? Several studies show that creativity and mood are linked.

- 1) distinctions 2) disorders 3) encounters 4) violations

4- The teacher told Ted's mother that her son did not as much interest in math as was expected of him.

- 1) fascinate 2) emphasize 3) manifest 4) incline

5- Blood vessels snake through our bodies, literally our life's blood, their courses visible through our skin only as faint bluish tracks or rosy cords.

- 1) revive 2) eroding 3) revolving 4) conveying

6- The remarkable physical transformation children undergo as they grow up is matched only by the of their minds.

- 1) metamorphosis 2) illustration 3) presumption 4) reversion

7- The third basic theory of moral development puts the emphasis on intellectual growth, arguing that and vice are ultimately a matter of conscious choice.

- 1) incentive 2) virtue 3) elegy 4) diagnosis

8- The court will require clear, evidence before its derision can be changed.

- 1) widespread 2) eventual 3) flexible 4) cogent

9- They accused that European countries of in their country's internal affairs.

- 1) exploiting 2) meddling 3) persisting 4) culminating

10- The first meeting will be in the City Hall, but all meetings will be held in the school.

- 1) sufficient 2) former 3) subsequent 4) incipient

Part B: Cloze Test

Directions: Read the following passage and decide which choice (1), (2), (3), or (4) best fits each space. The mark the correct choice on your answer sheet.

How long can humans stay awake? The quick answer is 264 hours, or 11 days, In 1965 Randy Gardner, a ... (11) ... set this apparent world record as a science-fair project. Several other research subjects have remained awake for eight to 10 days in ... (12) ..., none experienced serious medical or psychiatric problems, but all showed progressive and significant deficits in concentration, motivation, ... (13) ... and other higher mental processes. ... (14) ..., all returned to relative normalcy after one or two nights of sleep. Other anecdotal reports describe soldiers ... (15) ... awake for four days in battle and unmedicated patients with mania going without sleep for three to four days,

- 11-1) high school 17-year-old student 2) 17- year-old high school student
 3) student of high school aging 17 4) student in a 17-years-old high school
- 12-1) carefully monitored experiments 2) monitored careful experiments
 3) experiments with monitoring carefully 4) carefully monitoring experiments
- 13-1) the way to perceive 2) perceiving
 3) perception 4) to perceive
- 14-1) Conversely 2) Accordingly 3) Nevertheless 4) Whereas
- 15-1) staying 2) stayed 3) whose staying 4) those staying

Part c: Reading Comprehension

Directions: Read the following three passages and answer the questions by choosing the best choice (1), (2), (3), or (4). Then mark the correct choice on your answer sheet.

Passage 1:

Smart Grid

The United States (US) is going to secure 25% of the country's electricity from clean, renewable resources by 2025. Yet, renewable sources other than hydropower still provide only about 5% of the electricity supply for the US grid. What is holding the US back?

The grid is partly to blame. The physical reality is that the wind, solar, and geothermal resources are usually located in remote places, while much of the power demand is in urban areas. Like the interstate highway system, we need an electric superhighway that provides infrastructure for electricity to get from North Dakota to New York City easily and efficiently.

Geography issues aside, the current grid has difficulty accommodating variable sources of power like wind and solar energy, the fastest-growing sources of renewable power on the grid. As These resources begin to supply increasing percentages of power to the grid, integrating them into grid operations will become increasingly difficult.

A "Smart Grid" will be able to make better use of these energy resources. It will give grid operators new tools to reduce power demand quickly when wind or solar power dips, and it will have more energy storage capabilities to absorb excess wind and solar power when it is not needed, then to release that energy when the wind and solar power dips. In effect, energy storage will help to smooth out the variability in wind and solar resources, making them easier to use.

Building an electric superhighway can also help solve the problem, as it will help to ship the power to where it is needed. Studies have shown that connecting wind resources from a diversity of geographic locations helps to balance out fluctuations in wind power. In other words, when the wind is not blowing in Iowa, it may be blowing in North Dakota or Wyoming. Having such geographically diverse wind resources on a single electric superhighway will result in a more steady supply of wind power to the US power grid, making it easier for grid operators to make full use of this resource.

16- What does "grid" refer to?

- | | |
|--|----------------------------------|
| 1) Infrastructure for electricity delivery | 2) Interstate highway system |
| 3) Network | 4) Vertical and horizontal lines |

17- According to the passage,

- 1) Hydropower provides 5% of the electricity supply
- 2) 25% of electricity will be provided by hydropower by 2025
- 3) Renewable sources provide a large percentage of the electricity supply at present
- 4) Renewable sources other than hydropower provide a small fraction of the electricity supply

18- Which one of the following actions is not done by a Smart Grid to make better use of energy resources?

- | | |
|---------------------------------------|---|
| 1) Releasing energy when supplies dip | 2) Providing more energy storage capabilities |
| 3) Reducing power demand quickly | 4) Increasing different energy types |

19) What is the meaning of "remote" in the second paragraph?

- | | | | |
|------------|--------|----------|----------|
| 1) Control | 2) Far | 3) Rural | 4) Urban |
|------------|--------|----------|----------|

20- Which is not a main limitation of the current grid?

- | | |
|---|--------------------------------|
| 1) Geography issues | 2) Energy storage capabilities |
| 3) Accommodating different energy sources | 4) Accommodating excess energy |

Passage 2:

Radio frequency (RF) engineering is a subset of electrical engineering that deals with devices that are designed to operate in the Radio Frequency spectrum. These devices operate within the range of about 3 kHz up to 300 GHz. RF engineering is incorporated into almost everything that transmits or receives a radio wave, which includes, but is not limited to, Mobile Phones, Radios, WiFi, and walkie talkies. RF engineering is a highly specialized field falling typically in one of two areas; 1) providing or controlling coverage with some kind of antenna/transmission system and 2) generating or receiving signals to or from that transmission system to other communications electronics electronics or controls.

To produce quality results, an in-depth knowledge of mathematics, physics, general electronics theory as well as specialized training in areas such as wave propagation, impedance transformations, filters, microstrip circuit board design, etc. may be required, Because of the many ways RF is conducted both through typical conductors as well as through space, an initial design of an RF circuit usually bears very little resemblance to the final optimized physical circuit, Revisions to the design are often required to achieve intended results.

RF engineers are specialists in their respective field and can take on many different roles, such as design, installation, and maintenance. RF engineers require many years of extensive experience in the area of study. This type of engineer has experience with transmission systems, device design, and placement of antennas for optimum performance.

In addition, an RF design engineer must be able to understand electronic hardware design, circuit board material, antenna radiation, and the effect of interfering frequencies that prevent optimum performance within the piece of equipment being developed,

21- Why do we need to revise when an RF circuits is designed?

- 1) Because RF engineering is a highly specialized field.
- 2) Because of the different ways RF is conducted.
- 3) Because these circuits operate within the range of about 3 kHz up to 300 GHz.
- 4) Because an initial design of an RF circuit usually bears resemblance.

22- What does "deal with" mean in the first sentence?

- | | | | |
|---------------|------------|--------------|-----------|
| 1) agree with | 2) discuss | 3) cope with | 4) design |
|---------------|------------|--------------|-----------|

23- According to the text, which of the following statement is false?

- 1) An RF design engineer must be able to understand the effect of interfering frequencies.
- 2) RF engineers are specialists in their respective field such as design, installation, and maintenance.
- 3) RF engineering is connected with everything that transmits or receives a radio wave, for examples: Mobile Phones and WiFi.
- 4) RF devices don't operate within a limited range.

24- Which word is close to the "propagation" meaning?

- 1) conduction
- 2) dissemination
- 3) transmission
- 4) transition

25- Which word is close to the "propagation" meaning?

- 1) antenna radiation
- 2) electronic hardware design
- 3) microstrip circuit board design
- 4) software programming

Passage 3:

A signal as referred to in communication systems, signal processing, and electrical engineering is a function that conveys information about the behavior or attributes of some phenomenon. In the physical world, any quantity exhibiting variation in time or variation in space (such as an image) is potentially a signal that might provide information on the status of a physical system, or convey a message between observers, among other possibilities. The term "signal" includes, among others, audio, video, speech, image, communication, geophysical, sonar, radar, medical and musical signals.

A signal is physical quantity which varies with respect to time, space and contains information from source to destination.

Other examples of signals are the output of a thermocouple, which conveys temperature information, and the output of a pH meter which conveys acidity information. Typically, electrical signals are of tem provided by a sensor. Transducer is a device which converts a form of energy to another form of energy but sensor only converts a from of energy to electrical parameters. For example, a microphone is a sensor and converts an acoustic signal to a voltage waveform, and a speaker does the reverse but it is not a type of sensor. The formal study of the information content of signals is the field of information theory. The in, formation in a signal is usually accompanied by noise. The term noise usually means an undesirable random disturbance, but is often extended to include unwanted signals conflicting with the desired signal (such as crosstalk). The prevention of noise is covered in part under the heading of signal integrity. The separation of desired signals from a background is the field of signal recovery, one branch of which is estimation theory, a probabilistic approach to suppressing random disturbances.

26- A speaker converts

- 1) a voltage form to an acoustic signal form.
- 2) an acoustic signal to a voltage form.
- 3) a voltage form to another amplified voltage.
- 4) a low level acoustic signal to high level acoustic signal.

27- According to the text, which of the following statement is valid?

- 1) A signal is physical quality which varies with respect to time and space.
- 2) Noise is unwanted signal conflicting with the desired signal.
- 3) Information theory field discusses about transducers.
- 4) Image is not a type of signal information.

28- What does the word 'conveys' mean in the second line?

- 1) analyses
- 2) shows
- 3) carries
- 4) collects

29- Which definition is right for 'Transducer'? Transducer converts....

- 1) an acoustic signal to voltage waveform.
- 2) a voltage waveform to another form of energy
- 3) a form of energy to voltage waveform.
- 4) a form of energy to another form of energy.

30- What does the sentence "The prevention of noise is covered in part under the heading of signal integrity" mean?

- 1) Bt 'signal integrity' we could prevent of noise.
- 2) 'Signal integrity' is covered by noise.
- 3) Noise is a type of cover which is under the 'signal integrity'.
- 4) Noise covers the signals and we couldn't prevent it.

۳۱- جواب عمومی معادله دیفرانسیل $\frac{dy}{dx} = \cos y(1 - x \cos y)$ ، کدام است؟

(۱) $\frac{1}{\cos y} = x + 2 + ce^{-x}$

(۲) $\frac{1}{\cos y} = x + 1 + ce^{-x}$

(۳) $\frac{1}{\cos y} = x - 2 + ce^{+x}$

(۴) $\frac{1}{\cos y} = x + 1 + ce^{+x}$

۳۲- دو جواب مستقل خطی معادله دیفرانسیل $x^2 y'' + xy' + \left(x^2 - \frac{9}{4}\right)y = 0$ کدام است؟

(۱) $y_1(x) = J_{\frac{3}{2}}(x)$ ، $y_2(x) = J_{-\frac{3}{2}}(x)$

(۲) $y_1(x) = J_{\frac{3}{2}}(x)$ ، $y_2(x) = -y_1(x) \ln|x| + J_{-\frac{3}{2}}(x)$

(۳) $y_1(x) = J_{\frac{3}{2}}(x)$ ، $y_2(x) = y_1(x) \ln|x| + |x|^{-\frac{3}{2}} \sum_{n=0}^{\infty} b_n x^n$

(۴) $y_1(x) = J_{\frac{3}{2}}(x)$ ، $y_2(x) = y_1(x) \ln|x| + J_{-\frac{3}{2}}(x)$

۳۳- کدام یک جواب خصوصی $y_p(x)$ معادله دیفرانسیل $2x^2 \frac{d^2 y}{dx^2} + x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2y = 2x^4$ نیست؟

(۱) $\frac{1}{15}x^4 + 4x$

(۲) $\frac{1}{15}x^4 + 7x^2$

(۳) $\frac{1}{15}x^4 + x^{-2}$

(۴) $\frac{1}{15}x^4 + 2x^{-1}$

۳۴- جواب معادله $y'' + \frac{1}{x}y' = \frac{\sin x}{x}$ با شرایط $y(0) = 1$ و $y'(0) = 0$ ، کدام است؟

(۱) $y = 1 - \frac{x^2}{2 \times 2!} + \frac{x^4}{4 \times 4!} - \dots$

(۲) $y = 1 + \frac{x^2}{2 \times 2!} - \frac{x^4}{4 \times 4!} + \dots$

(۳) $y = 1 - \frac{x^2}{2 \times 2!} - \frac{x^4}{4 \times 4!} - \dots$

(۴) $y = 1 + \frac{x^2}{2 \times 2!} + \frac{x^4}{4 \times 4!} + \dots$

۳۵- اگر تابع $f(x) = \sin^2 \frac{x}{2} + \sin^2 \frac{3x}{2} + \sin^2 \frac{5x}{2}$ باشد، مقدار انتگرال $A = \int_{-\pi}^{\pi} f(x) dx$ کدام است؟

(۱) 6π

(۲) $\frac{21}{4}\pi$

(۳) $\frac{21}{8}\pi$

(۴) $\frac{21}{4}\pi$

۳۶- درجه حرارت $u(x, t)$ میله‌ای به طول π که دو طرف آن، در مخلوط آب و یخ قرار گرفته و دمای اولیه آن $u(x, 0) = \sin x$ است، و در معادله $u_t = u_{xx} = 0$ صدق می‌کند، کدام است؟

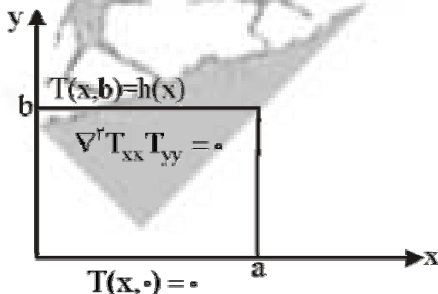
(۱) $e^{-t} \sin 2x$

(۲) $e^{-t} \sin x$

(۳) $e^t \sin x$

(۴) $e^{2t} \sin x$

۳۷- پایه متعامد مورد نیاز برای استفاده در حل مساله مقدار مرزی داده شده از طریق جداسازی متغیرها، کدام است؟ $h(x)$ تابعی تکه‌ای هموار و معلوم است)



(۱) $\frac{1}{2}, \sin \frac{2\pi x}{a}, \cos \frac{2\pi x}{a}, \dots, \sin \frac{2n\pi x}{a}, \cos \frac{2n\pi x}{a}, \dots$

(۲) $\frac{1}{2}, \sin \frac{\pi x}{a}, \cos \frac{\pi x}{a}, \dots, \sin \frac{n\pi x}{a}, \cos \frac{n\pi x}{a}, \dots$

(۳) $\frac{1}{2}, \sin \frac{\pi x}{a}, \cos \frac{\pi x}{a}, \dots, \sin \frac{(2n-1)\pi x}{a}, \cos \frac{(2n-1)\pi x}{a}, \dots$

(۴) $\sin \frac{2\pi x}{a}, \cos \frac{2\pi x}{a}, \dots, \sin \frac{2n\pi x}{a}, \cos \frac{2n\pi x}{a}, \dots$

$T(0, y) = T(a, y)$

شرایط مرزی روی دو ضلع راست و چپ:

$T_x(0, y) = T_x(a, y)$

۳۸- در مورد تابع مختلف $f(z) = \begin{cases} \frac{(\bar{z})^2}{z} & , z \neq 0 \\ 0 & , z = 0 \end{cases}$ ، گزینه صحیح کدام است؟

(۱) در مبدأ $(0,0)$ روابط کشی - ریمان برقرار نیستند.

(۲) در نقطه $z = 0$ مشتق پذیر است.

(۳) مشتقات جزئی مرتبه اول توابع حقیقی $\text{Re}f(z)$ و $\text{Im}f(z)$ در $(0,0)$ پیوسته نیستند.

(۴) در نقطه $z = 0$ مشتق پذیر نیست چون روابط کشی - ریمان در مبدأ برقرار نیست.

۳۹- دایره‌ای به مرکز نقطه Z_0 و به شعاع ρ به قسمی که $\rho_0 = |Z_0|$ ، در صفحه z مفروض است. در اثر تبدیل $w = \frac{1}{z}$ ، معادله این

دایره به کدام رابطه در صفحه w تبدیل می‌شود؟

(۲) $1 - 2\text{Re}(z_0 w) = 0$

(۱) $1 + 2\text{Re}(\bar{z}_0 \bar{w}) = 0$

(۴) $1 - 2\text{Re}(\bar{z}_0 w) = 0$

(۳) $1 + 2\text{Re}(z_0 w) = 0$

۴۰- مرز ساده بسته‌ای پیموده شده در جهت مثلثاتی است، که به ازای هر نقطه z روی آن داریم $|z| > 1$ ، در این صورت مقدار

انتگرال $\oint_C \frac{dz}{(z^n + 1)}$ ($n > 1$ عدد طبیعی) کدام است؟

(۴) $2\pi i n$

(۳) 0

(۲) $-2\pi i n$

(۱) $\frac{-2\pi i}{n}$

۴۱- X_1, X_2, X_3 سه متغیر تصادفی یواسن مستقل از هم با پارامترهای به ترتیب $\lambda_1 = 4, \lambda_2 = 2, \lambda_3 = 1$ می‌باشند. اگر

$Y = X_1 + 2X_2 + 4X_3$ باشد، آنگاه احتمال $P(Y < 2)$ برابر کدام است؟

(۴) $13e^{-12}$

(۳) $1 - e^{-12}$

(۲) $8e^{-7}$

(۱) $1 - e^{-7}$

۴۲- تابع چگالی احتمال توأم X و Y به صورت زیر داده شده است.

$$f(x,y) = \begin{cases} ce^{-x-y} & , 0 < x, 0 < y \\ 0 & \text{در غیر این صورت} \end{cases}$$

تابع چگالی احتمال $f_{\frac{X}{Y}}(a)$ متغیر تصادفی $\frac{X}{Y}$ ، کدام است؟

(۲) $\frac{a}{a+1}, \forall a > 0$

(۱) $\frac{1}{(a+1)^2}, \forall a > 0$

(۴) $\frac{a^2}{(a+1)^2}, \forall a > 0$

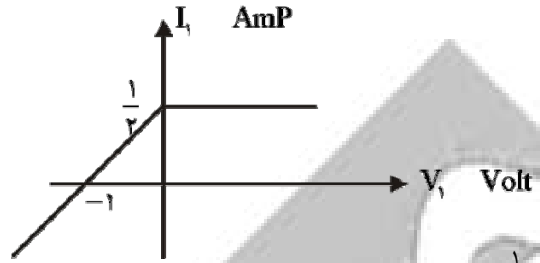
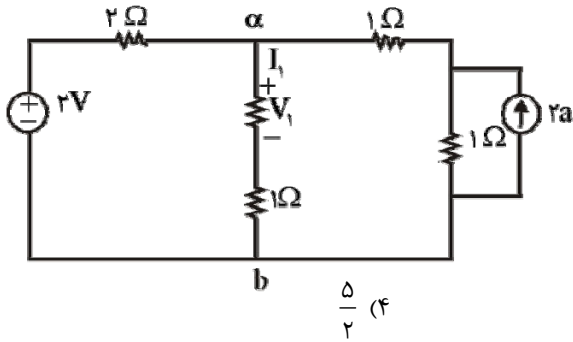
(۳) $\frac{a}{(a+1)^2}, \forall a > 0$



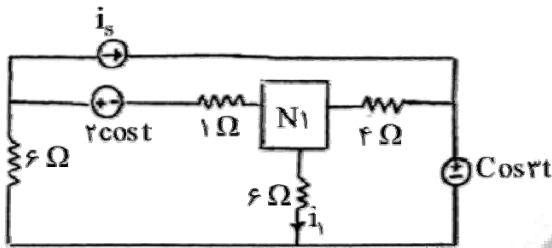
۴۳- گراف مداری پنج گره و نه شاخه دارد. تعداد ولتاژهای مستقل از هم مدار برابر کدام است
(۱) تعداد معادلات KCL مستقل از هم مدار

(۲) تعداد جریان‌های مستقل از هم مدار
(۳) تعداد معادلات KVL مستقل از هم مدار
(۴) $\frac{5}{2}$ تعداد معادلات KVL مستقل از هم مدار

۴۴- ولتاژ V_{ab} در مدار زیر، چند ولت است؟



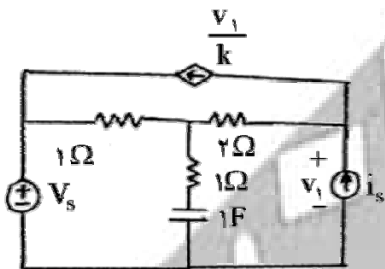
۴۵- در مدار مقاومتی خطی با جواب یگانه زیر، اگر $i_s = 5 \sin 2t + 4$ آمپر باشد، در جریان i_1 یکی از جملات برابر $-\frac{1}{5} \cos t$ است.



جمله ثابت در i_1 کدام است؟ (N_1 بدون منابع مستقل است.)

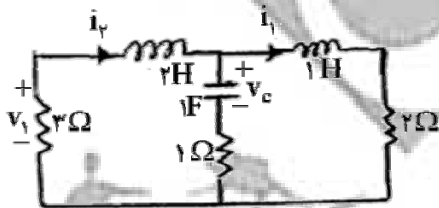
- (۱) -۶
- (۲) -۲/۴
- (۳) -۰/۴
- (۴) ۴

۴۶- فرکانس طبیعی مدار زیر، برابر $-\frac{1}{3}$ است. وقتی خازن اتصال باز است، چه مقاومتی از دو سر منبع جریان مستقل دیده می‌شود؟ (k ثابت)



- (۱) -4Ω
- (۲) 2Ω
- (۳) 8Ω
- (۴) 12Ω

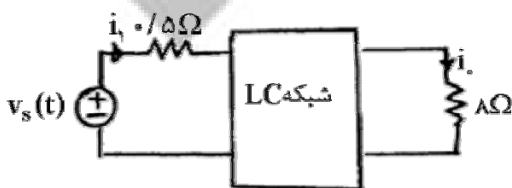
۴۷- در مدار زیر اگر $i_1(0^-) = i_1(0^+) = 1$ آمپر و $v_c(0^-) = 1$ ولت باشد، مقدار $v_1(0^+)$ برابر کدام است؟



- (۱) ۳
- (۲) ۶
- (۳) ۹
- (۴) ۱۲

۴۸- در مدار روبه‌رو، که در وضعیت دائمی سینوسی قرار دارد، اگر $v_s(t) = \cos \omega t$ ولت و $i_1(t) = \frac{1}{\sqrt{2}} \cos(\omega t - \frac{\pi}{3})$ آمپر باشد.

دامنه جریان $i_o(t)$ چند آمپر است؟

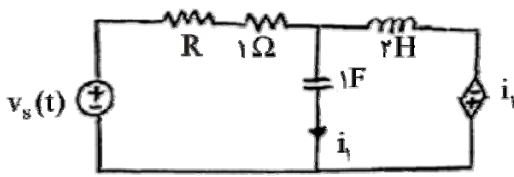


- (۱) $\frac{1}{8}$
- (۲) $\frac{1}{40}$
- (۳) $\frac{1}{4}$
- (۴) $\frac{1}{2}$

(۸)

۴۹- وقتی در وضعیت دائمی سینوسی با فرکانس $\omega = 1 \frac{\text{rad}}{\text{sec}}$ ، بیشترین توان متوسط مقاومت R برابر $2\sqrt{5}$ وات است. مجموع

توان‌های متوسط منابع ولتاژ چند وات است.



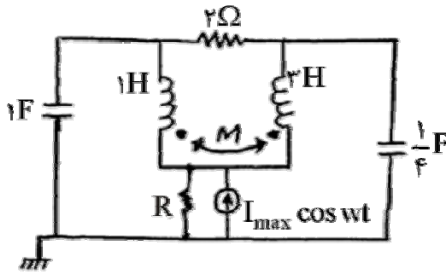
(۱) $-2(\sqrt{5}+1)$

(۲) $-2\sqrt{5}$

(۳) $+2(\sqrt{5}+1)$

(۴) $3\sqrt{5}$

۵۰- در مدار زیر، در وضعیت دائمی سینوسی جریان مقاومت 2Ω صفر است، مقدار M چند هنری است؟



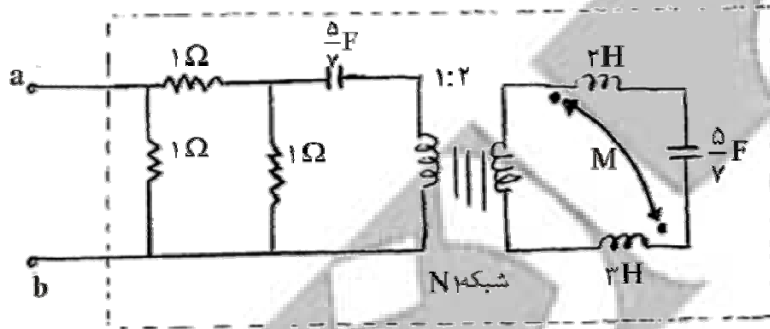
(۱) $\frac{1}{6}$

(۲) $\frac{1}{3}$

(۳) $\frac{1}{2}$

(۴) $\frac{2}{3}$

۵۱- ضریب تزویج متقابل M را به نحوی تعیین کنید که ضریب توان حقیقی N_1 در فرکانس $\omega = 1 \frac{\text{rad}}{\text{sec}}$ برابر یک باشد؟



(۱) $M = \frac{1}{3} \text{H}$

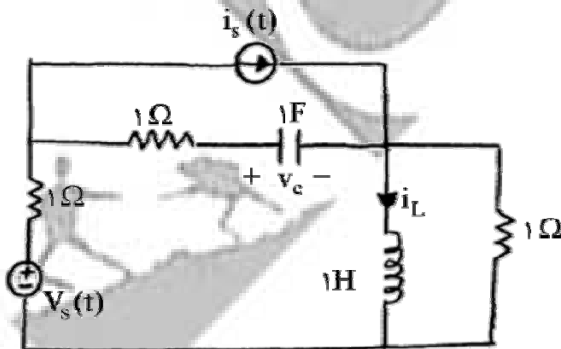
(۲) $M = \frac{1}{2} \text{H}$

(۳) $M = 2 \text{H}$

(۴) $M = 1 \text{H}$

۵۲- در مدار زیر، با انتخاب $\underline{X} = \begin{bmatrix} v_c \\ i_L \end{bmatrix}$ به عنوان بردار حالت، ماتریس \underline{A} در معادلات حالت برابر کدام است؟

($\dot{x} = Ax + Bw$)



(۴) $\underline{A} = \begin{bmatrix} 1 & -1 \\ 1 & 2 \end{bmatrix}$

(۳) $\underline{A} = \begin{bmatrix} -1 & 1 \\ 3 & 3 \end{bmatrix}$

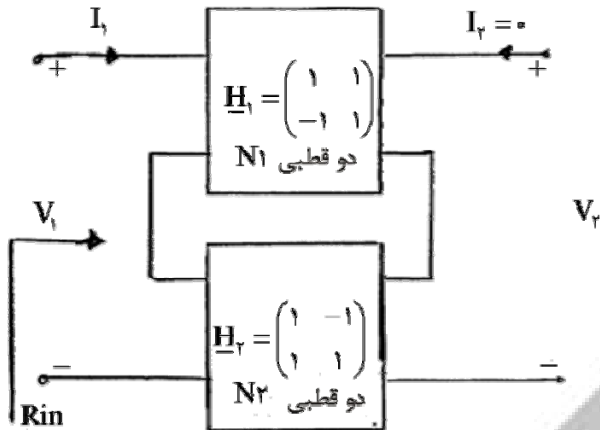
(۲) $\underline{A} = \begin{bmatrix} 1 & -1 \\ 3 & 3 \end{bmatrix}$

(۱) $\underline{A} = \begin{bmatrix} -1 & 1 \\ -1 & -2 \end{bmatrix}$

۵۳- در مدار مرتبه سوم A، تابع انتقال $\frac{V_o}{V_s} = \frac{10}{(s+1)(s+2)}$ و در مدار مرتبه سوم B تابع انتقال $\frac{V_o}{V_s} = \frac{5}{(s+1)^2(s+2)}$ را داریم. در کدام مدار با $v_s = \cos t$ حتماً $V_o(t)$ را داریم و با کدام دامنه سینوسی؟

- (۱) در موارد B با دامنه $\frac{1}{4}$
 (۲) در مدار A با دامنه $\frac{1}{4}$
 (۳) در مدار A با دامنه $\sqrt{10}$
 (۴) در مدار B با دامنه $\frac{\sqrt{5}}{2}$

۵۴- در اتصال دو تا دو قطبی روبرو، مقاومت ورودی کل با $I_r = 0$ چند اهم است؟ \underline{H}_1 و \underline{H}_r ماتریس‌های هایبرید هستند و بعد از اتصال دو قطبی‌ها تغییر نمی‌کنند)



- $\frac{1}{4}$ (۱)
 $\frac{1}{2}$ (۲)
 $\frac{1}{4}$ (۳)
 $\frac{1}{2}$ (۴)