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407A

نام :

نام خانوادگی :

محل امضاء :

دفترچه شماره ۱
عصر پنج‌شنبه
۹۲/۱۱/۱۷

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

جمهوری اسلامی ایران
وزارت علوم، تحقیقات و فنّاوری
سازمان سنجش آموزش کشور

آزمون ورودی دوره‌های کارشناسی ارشد ناپیوسته داخل ــ سال ۱۳۹۳

مجموعه مهندسی برق ــ کد ۱۲۵۱

تعداد سؤال: ۵۴ | مدت پاسخگویی: ۱۰۵ دقیقه

عنوان مواد امتحانی، تعداد و شماره سؤالات

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 ۱۳۹۲

استفاده از ماشین حساب مجاز نمی‌باشد.

این آزمون دارای نمرهٔ منفی است.

Part A: Vocabulary

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

1- Bad weather has _____ the bombers that lack modern night-attack equipment.
1) grasped 2) hampered 3) utilized 4) abated

2- Jacob was _____ for always arriving late for work, a habit that finally led to his being fired from work.
1) haphazard 2) infinite 3) innate 4) notorious

3- It would put his career at risk, but that was already in _____, so what had he to lose?
1) jeopardy 2) perspective 3) magnitude 4) neglect

4- Legal requirements state that working hours must not _____ 42 hours a week.
1) legitimize 2) linger 3) mingle 4) exceed

5- The student's essay was empty of errors, indicating that it had been _____ written.
1) painstakingly 2) massively 3) impartially 4) ingenuously

6- The boy was simply a beggar: his bundle of newspapers was a _____, and we called him the Newspaper Boy.
1) legend 2) limitation 3) pretext 4) drawback

7- I do not _____ ever having been to Paris, although my mother says we went there when I was a child.
1) rehearse 2) recollect 3) recede 4) recast

8- Because of _____ conditions, the hikers decided to give up trying to climb the mountain.
1) vague 2) ungainly 3) adverse 4) vigorous

9- I sat watching as the sun reached its _____ and the muezzin began to call the people to prayers.
1) lucidity 2) triumph 3) spectacle 4) zenith

10- The children were tired and _____ and didn't seem interested in any of the games.
1) sluggish 2) mandatory 3) strict 4) cordial

Part B: Cloze Passage

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

A healthy man in his early 60s begins to notice that his memory isn't (11) _____. More and more often, a word will be (12) _____the tip of his tongue but he just can't remember it. He forgets appointments, makes mistakes (13) _____, and finds that he's often confused or (14) _____ about the normal hustle and bustle of life around him. One evening, he suddenly finds himself (15) _____ in a neighborhood a couple of miles from his house. He has no idea how he got there.

11- 1) used to being as well 2) as good as it used to be
3) is not so well as it used to be 4) used as well as was it

12- 1) with 2) by 3) on 4) at

13- 1) pays his bills 2) when paying his bills
3) while bills paid 4) to pay the bills he does

14- 1) anxiously 2) anxiety 3) anxious 4) be anxious

15- 1) although walking 2) while he is walking
3) he is walking 4) walking

Part C: Reading comprehension

Directions: Read the following five 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:

A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against known standards.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics.

A sensor is a device, which responds to an input quantity by generating a functionally related output usually in the form of an electrical or optical signal. A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes. Sensors that measure very small changes must have very high sensitivities. Sensors also have an impact on what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors need to be designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages.

16- What does the sentence "Sensors also have an impact on what they measure" mean in the last paragraph?

1) Sensors compress what is measured.
2) Sensors have an effect on measured quantity.
3) Sensors are influenced by the measured quantity.
4) Sensor's output changes when the measured quantity changes.

17- According to the text, which of the following statements is valid?

1) Thermometers and thermocouples are the same.
2) A sensor's sensitivity indicates how much the sensor's input changes.
3) Sensors that measure very small changes must have negligible sensitivities.
4) Sensors have outputs usually in the form of an electrical, optical signal, or other readable quantity.

18- What does the word 'innumerable' mean in the second paragraph?

1) finite 2) countable 3) countless 4) extendible

Passage 2:

Microwaves are a form of electromagnetic radiation with wavelengths ranging from as long as one meter to as short as one millimeter, or equivalently, with frequencies between 300 MHz (0.3 GHz) and 300 GHz. The prefix "micro-" in "microwave" is not meant to suggest a wavelength in the micrometer range. It indicates that microwaves are "small" compared to waves used in typical radio broadcasting, in that they have shorter wavelengths. The boundaries between far infrared light, terahertz radiation, microwaves, and ultra-high-frequency radio waves are fairly arbitrary and are used variously between different fields of study.

Microwave technology is extensively used for point-to-point telecommunications (i.e., non-broadcast uses). Microwaves are especially suitable for this use since they are more easily focused into narrow beams than other radio waves, allowing frequency reuse; their comparatively higher frequencies allow broad bandwidth and high data transmission rates, and antenna sizes are smaller than at lower frequencies because antenna size is inversely proportional to transmitted frequency. Microwaves are also employed in microwave ovens and in radar technology.

Beginning at about 20 GHz, the atmosphere becomes less transparent to microwaves, due at lower frequencies, to absorption from water vapor and at higher frequencies from oxygen. Above 300 GHz, the absorption of electromagnetic radiation by Earth's atmosphere is so great that it is in effect opaque, until the atmosphere becomes transparent again in the so-called infrared and optical window frequency ranges.

19- According to the text, which of the following statements is false?

1) Microwave ovens and radars use frequencies above 300 MHz .
2) Antenna size is not directly proportional to transmitted frequency.
3) Microwaves higher frequencies allow high data transmission rates.
4) Microwaves are a form of electromagnetic radiation with wavelengths in the micrometer range .

20- What does the sentence "it is in effect opaque" mean in the last paragraph?

1) The atmosphere becomes transparent to microwaves .
2) The atmosphere transmits the electromagnetic radiation.
3) The electromagnetic radiation can't penetrate the atmosphere.
4) Water vapor and oxygen at higher frequencies could not absorb the radiation.

21- Why are microwaves suitable for point-to-point telecommunications? Because --------.

1) the atmosphere becomes less transparent to microwaves
2) they are more easily diverged into beams than radio waves
3) above 300 GHz, the absorption of electromagnetic radiation by Earth's atmosphere is significant
4) of their ability to become focused and their high data transmission rates

Passage 3:

When UMTs was designed, it was a bold approach to specify an air interface with a carrier bandwidth of 5MHz. Wideband Code Division Multiple Access (WCDM), the air interface chosen at that time, performed very well within this limit. On the other hand, if the bandwidth of the carrier is increased to attain higher transmission speeds, the time between two transmission steps has to decrease. The shorter a transmission step, the greater the impact of multipath fading on the received signal. Multipath fading causes the receiver not to see one signal but several copies arriving at different times. As a result, parts of the signal of a previous transmission step that has bounced off objects and thus took longer to travel to the receiver overlap with the radio signal of the current transmission step that was received via a more direct path. This averlap is often referred to as inter-symbol interference (ISI). The shorter a transmission step, the more the overlap that can be observed and the more difficult it gets for the receiver to correctly interpret the received signal. With long term evolution (LTE), instead of spreading one signal over the complete carrier bandwidth (e.g.5MHZ), Orthogonal Frequency Division Multiplexing (OFDM) is used that transmits the data over many narrowband carriers of 180 KHz each, and hence increasing the transmission step size. Instead of a single fast transmission, a data stream is split into many slower data streams that are transmitted simultaneously and according to LTE standard, it is possible to enjoy from a wider bandwidth than that of UMTS.

22- Which statement is not true in the context of UMTS & LTE?

1) In UMTS networks, ISI can become a more stringent drawback at wider bandwidths than 5 MHz.
2) OFDM is a new air interface technology capable of handling wider bandwidths than that of WCDMA.
3) The air interface used in UMTS networks has full capability of supporting higher data rates when the maximum bandwidth exceeds 5 MHz.
4) In an LTE network, the high-rate data-streams are divided into several lower rate streams to counteract the adverse effects of multipath fading channel.

23- LTE networks ----------.

1) are more robust to ISI than UMTS networks when both operating at similar bandwidths and within same propagation channel.
2) use a total of 180 kHZ bandwidth which is allocated to many slower data streams for simultaneous transmission.
3) are more resilient to negative effects of multipath channels only due to higher signal power at the transmitter side.
4) 1 & 3

24- OFDM ---------.

1) is only suitable for those bandwidths that are suitable for WCDMA
2) accomplishes its primary effect on increasing the transmission step size by changing the carrier bandwidth
3) cannot mitigate the ISI effect more efficiently than WCDMA when the underlying scenario remains the same
4) achieves slower transmission rates than WCDMA as it splits the data stream into low-rate sub-streams

Passage 4:

The electron has a pesky ability to penetrate barriers-a phenomenon known as quantum tunneling. As chipmakers have squeezed ever more transistors onto a chip, transistors have gotten smaller, and the distances between different transistor regions have decreased. So today, electronic barriers that were once thick enough to block current are now so thin that electrons can barrel right through them.

Chipmakers have already stopped thinning one key transistor component-the gate oxide. This layer electrically separates the gate, which turns a transistor on and off, from the current-carrying channel. Make this oxide thinner and you can induce more charge in the channel, boost the current, and make the transistor faster. But you can't reduce the oxide thickness to much less than roughly a nanometer, which is about where it is today. Beyond that, too much current will flow across the channel when the transistor is "off", when ideally no current should flow at all. And that's just one of several leakage points.

We cannot stop electrons from tunneling through thin barriers, but we can turn this phenomenon to our advantage. In the last few years, a new transistor design-the tunnel FET, or TFET-has been gaining momentum. Unlike the MOSFET, which works by raising or lowering an energy barrier to control the flow of current, the TFET keeps this energy barrier high. The device switches on and off by altering the likelihood that electrons on one side of that barrier will materialize on the other side.

25- What are the advantages of thinning the oxide gate?

1) Making the transistor faster 2) Raising the transistor current
3) Flow of current when the transistor is off 4) 1 & 2

26- What does the term 'them' in the first paragraph refer to?

1) Barriers 2) Boards 3) Chips 4) Electrons

Passage 5:

While the use of various nanoparticles for delivering drugs to specific targets in the body has been with us for a decade now and has already created a billion-dollar industry for itself, this marks the first time that magneto-electric nanoparticles (MENs) have been used for ovarian cancer therapy.

The basis of nano-enabled drug delivery has typically involved connecting the nanoparticle to some antibody that is attracted to a tumor and sending the nanoparticle through the bloodstream to find its target. There has been some question about the efficacy and specificity of this antibody approach. This new technology developed appears to be more specific because it separates the cancer cells from the healthy cells by exploiting differences in the electrical properties of the two kinds of cells' membranes.

This separation is achieved because of the unique properties of the MENs. Unlike typical magnetic nanoparticles (MN), which can be controlled by a remote magnetic field, the MENs can have their intrinsic electric fields controlled by the external magnetic field. This means that the MENs can operate as localized magnetic-to-electric-field nano-converters. In other words, the MENs can generate the electric signals that govern molecular interactions. By creating a particular electric field, the MENs change the membrane properties of the cancer cells and not the healthy cells making them more porous. As the *Scientific Reports* article describes it: "The interaction between the MENs and the electric system of the membrane effectively serves as a field-controlled gate to let the drug-loaded nanoparticles enter specifically the tumor cells only."

27- Based on the passage, what is the main advantage of MENs over other techniques?

1) It is easier to use.
2) It works faster.
3) It is more cost efficient.
4) It treats cancer while sparing healthy cells.

28- Which statement is TRUE?

1) MNs can be controlled by an external magnetic field.
2) MENs is a more specific approach than the antibody approach.
3) In nano-enabled drug delivery, the nanoparticle is attracted to a tumor by itself.
4) With the MENs approach, the drug-loaded nanoparticles may enter the healthy cells.

29- What does the word "porous" in paragraph 3 mean?

1) Damaged 2) Spongy 3) Sensitive 4) Thinned

30- What does "its" in "its target" in the second paragraph refer to?

1) Antibody 2) Drug 3) Nanoparticle 4) Tumor

محل انجام محاسبات

۳۱- معادله‌ی دیفرانسیل $x\frac{dy}{dx}+y^{۲}=۰$ با شرط اولیه $y(۱)=۱$ مفروض است بزرگترین بازه x که در آن مسأله مقداراولیه دارای جواب باشد، کدام است؟

۱) $(-\infty,\frac{۱}{e})$ ۲) $(-\infty,\frac{۱}{e}]$

۳) $[\frac{۱}{e},\infty)$ ۴) $(\frac{۱}{e},\infty)$

۳۲- اگر $W(f,g)$ رنسکین (Wronskian) مربوط به توابع f و g باشد و تعریف کنیم $u=۲f-g$ و $v=f+۲g$ ، آنگاه رنسکین $W(u,v)$ مربوط به توابع u و v برحسب $W(f,g)$ عبارت است از:

۱) $۲\,W(f,g)$ ۲) $۳\,W(f,g)$

۳) $۵\,W(f,g)$ ۴) $۹\,W(f,g)$

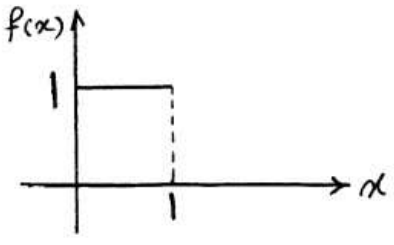
۳۳- اگر معادله دیفرانسیل $x^{۲}y''+xy'+(x^{۲}-\alpha^{۲})y=۰$ جوابی به صورت $J_{\alpha}(x)=\frac{۱}{\pi}\int_{۰}^{\pi}\cos(\alpha\theta-x\sin\theta)d\theta$ داشته باشد آنگاه $\frac{۱}{\pi}\int_{۰}^{\pi}\sin^{۲}\theta\cos(x\sin\theta)d\theta$ برابر است با:

۱) $-J_{۰}(x)$ ۲) $-J'_{۰}(x)$

۳) $-J''_{۰}(x)$ ۴) $-J'''_{۰}(x)$

۳۴- برای تابع $f(x)$، وقتی که $۰\le x\le ۱$ است، یک سری به شکل زیر نوشته شده است، مقدار ضریب $a_{۳}$ چقدر است؟

$$f(x)=\sum_{n=۱,۳,۵}^{+\infty}a_n\cos(\frac{n\pi}{۲}x)\ ,\quad ۰\le x\le ۱$$



۱) $-\frac{۴}{۳\pi}$

۲) $-\frac{۲}{۳\pi}$

۳) ۰

۴) $\frac{۴}{۳\pi}$

محل انجام محاسبات

۳۵- تابع $f(x)$ و تبدیل فوریه آن به صورت زیر تعریف شده‌اند:

$$f(x)=\begin{cases}\sinh|x| & ,-\pi<x<\pi\\ \circ & \text{در غیر این صورت}\end{cases}$$ و

$F(\omega)=\int_{-\infty}^{+\infty}f(x)e^{-j\omega x}dx$، مقدار $F(1)$ برابر است با:

۱) $-2\cosh\pi-2$ ۲) $-\cosh\pi-1$

۳) $-2\cosh\pi+2$ ۴) $-\cosh\pi+1$

۳۶- در مسأله مقدار مرزی

$$\begin{cases}y''+\gamma y=\circ & ,\gamma>\circ\\ y(\circ)=\circ\ ,\ y(1)+y'(1)=\circ\end{cases}$$

مقادیر ویژه در کدام معادله صدق می‌کند؟

۱) $\tan\sqrt{\gamma}-\sqrt{\gamma}=\circ$ ۲) $\tan\sqrt{\gamma}+\sqrt{\gamma}=\circ$

۳) $\cot\sqrt{\gamma}-\sqrt{\gamma}=\circ$ ۴) $\cot\sqrt{\gamma}+\sqrt{\gamma}=\circ$

۳۷- در مسأله مقدار اولیه مرزی موج یک بعدی زیر، که در آن $h(x)$ تابعی تکه‌ای پیوسته است،

$$\begin{cases}u_{tt}-a^2u_{xx}=\circ\ ,\ \circ<x<1\ ,\ t>\circ\\ u(x,\circ)=\circ\ ,\ u_t(x,\circ)=h(x)\ ,\ \circ\le x\le 1\\ u(\circ,t)=u(1,t)=\circ,\ t>\circ\end{cases}$$

مقدار $u(\frac{1}{3},\frac{13}{a})$ کدام است؟

۱) -1

۲) $\circ$

۳) 1

۴) نمی‌توان گفت چون تابع $h(x)$ مقدارش داده نشده

محل انجام محاسبات

۳۸- مسأله مقدار مرزی زیر در داخل یک نیم دایره به مرکز O و به شعاع a و با یک قطر واقع بر محور x را در نظر می‌گیریم:

$$\begin{cases} \nabla^2 T = T_{rr} + \frac{1}{r}T_r + \frac{1}{r^2}T_{\theta\theta} = 0 \ , 0 < r < a \\ T_\theta(r,0) = 0 \ , \ T(r,\pi) = 0 \ , 0 \le r \le a \\ T(a,\theta) = h(\theta) \quad \text{تکه‌ای هموار داده شده} \ , \ 0 \le \theta \le \pi \end{cases}$$

پایهٔ متعامد بسط فوریه تابع h مفروض کدام است؟

۱) $\left\{\cos(\frac{2k-1}{2}\theta)\right\}_{k=1}^{\infty}$

۲) $\{\cos(k\theta)\}_{k=1}^{\infty}$

۳) $\left\{\frac{1}{2}, \cos\theta, \cos 2\theta, \cos 3\theta, ..., \cos n\theta, ...\right\}$

۴) $\left\{\frac{1}{2}, \cos\frac{\theta}{2}, \cos\frac{3\theta}{2}, \cos\frac{5\theta}{2}, ..., \cos\frac{2n-1}{2}\theta, ...\right\}$

۳۹- نوار $\frac{\pi}{2} < \text{Im}\{z\} < \pi$ تحت نگاشت $w = \frac{1+e^z}{1-e^z}$ به چه ناحیه‌ای در صفحه w تبدیل می‌شود؟

۱) داخل نیم‌دایره واحد که در آن $\text{Im}\{w\} > 0$

۲) داخل مثلث متساوی الساقین با رئوس $(0 , -1) , (1 , 0) , (0 , 1)$

۳) تمام صفحه مختلط به غیر از داخل نیم دایره واحد که در آن $\text{Im}\{w\} > 0$

۴) تمام صفحه مختلط به غیر از داخل مثلث متساوی‌الساقین با رئوس $(0,1), (1,0) , (-1,0)$

۴۰- مانده‌ی تابع $f(z) = e^z \sinh\frac{1}{z}$ حول نقطه‌ی $z = 0$ برابر است با:

۱) $\sinh 1$ ۲) $-\sinh 1$

۳) $\sum_{n=0}^{\infty}\frac{1}{(2n)!}$ ۴) $\sum_{n=0}^{\infty}\frac{1}{(2n)!(2n+1)!}$

محل انجام محاسبات

۴۱- در یک جعبه ۱۶ مهره قرمز با شماره‌های ۱ تا ۱۶ و ۴ مهرهٔ سفید با شماره‌های ۱ تا ۴ قرار دارد. یک مهره را به تصادف از جعبه خارج می‌کنیم. اگر رنگ آن سفید نباشد یا شماره آن یک نباشد. آن را به جعبه برمی‌گردانیم. آزمایش را آنقدر تکرار می‌کنیم تا مهرهٔ بیرون آمده سفید یا شمارهٔ آن ۱ باشد. متغیر تصادفی X را مساوی تعداد دفعات آزمایش فرض کنید. احتمال $p\{x = n\}$ برای $n = ۱,۲,۳,...$ چقدر است؟

۱) $(\frac{۱}{۲})^n$

۲) $\frac{۵}{۸}(\frac{۳}{۸})^{n-۱}$

۳) $\frac{۱}{۳}(\frac{۳}{۴})^n$

۴) $\frac{۱}{۸}(\frac{۳}{۴})^{n-۱} + \frac{۱}{۱۶}(\frac{۷}{۸})^{n-۱}$

۴۲- متغیر تصادفی X یک متغیر تصادفی یکنواخت در بازه $(۰,۱)$ می‌باشد. متغیر تصادفی Y با احتمال یکنواخت در بازه $(۰,X)$ انتخاب می‌شود. تابع چگالی احتمال متغیر تصادفی Y در نقطه $Y = \frac{۱}{۲}$ چه مقداری دارد؟

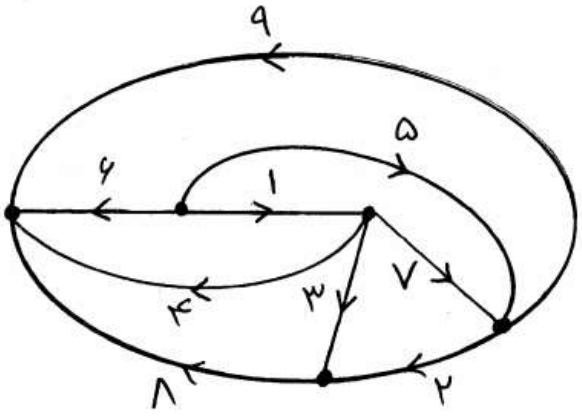
۱) $\frac{۱}{۴}$

۲) $\frac{۱}{۲}$

۳) $۲Ln۲$

۴) $Ln۲$

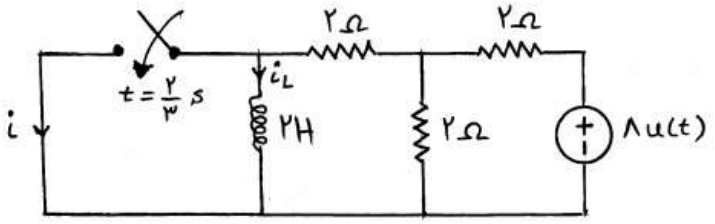
۴۳- در گراف متّصل زیر، مجموعه شاخه‌های $\{1,2,3,6\}$ به عنوان درخت انتخاب می‌شوند. کدام یک از حلقه‌های زیر، یک حلقه‌ی اساسی این درخت نمی‌باشد؟



۱) $\{1,3,8,6\}$
۲) $\{1,4,6\}$
۳) $\{1,7,6,9\}$
۴) $\{2,3,7\}$

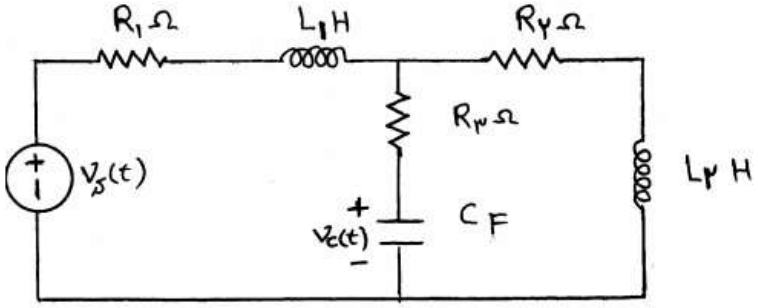
۴۴- در مدار زیر کلید در $t=\frac{2}{3}s$ بسته می‌شود. جریان i در $t=1$ چند آمپر است؟

$(i_L(\overline{0})=0)$



۱) $\frac{4}{3}$
۲) $\frac{4}{3}e^{-1}$
۳) $\frac{4}{3}(1-e^{-1})$
۴) $-e^{-1}$

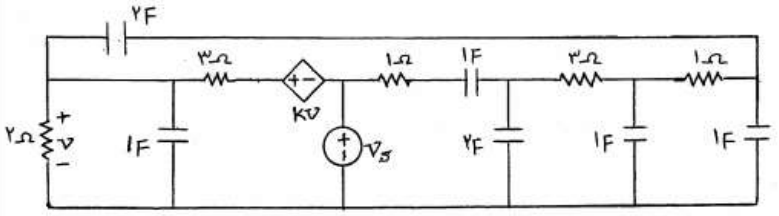
۴۵- در مدار زیر وقتی در $t = 0$ منبع ولتاژ v_s تغییر آنی می‌کند، ولتاژ خازن v_c طبق کدام یک از توابع زیر تغییر خود را شروع می‌کند؟



۱) $u(t)$ ۲) $\delta(t)$

۳) $tu(t)$ ۴) $t^2u(t)$

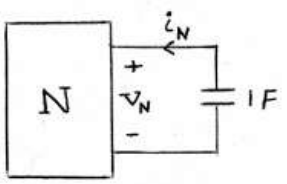
۴۶- به ازای چه مقدار k مدار دو فرکانس طبیعی صفر دارد؟

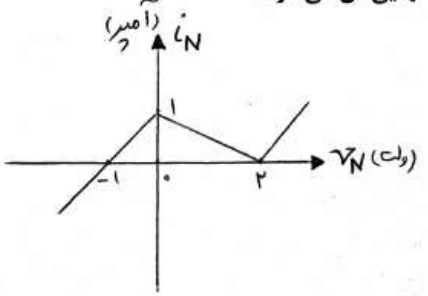


۱) $-\frac{5}{2}$ ۲) -1

۳) 3 ۴) $\frac{5}{2}$

۴۷- اگر ولتاژ اولیه خازن صفر ولت باشد، بعد از چه مدتی ولتاژ خازن نصف مقدار نهایی آن می‌شود؟

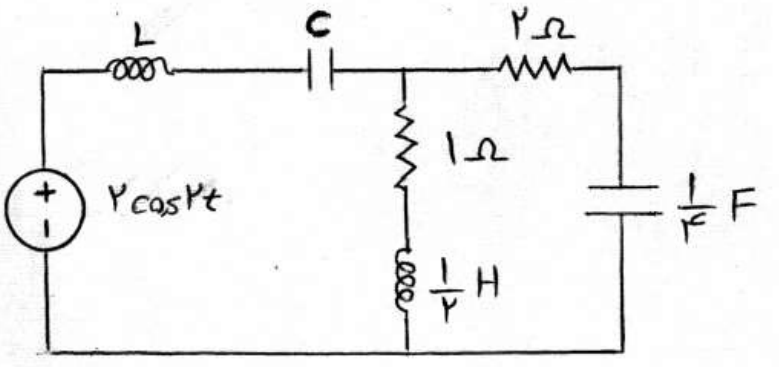




۱) ۱ ۲) ۲

۳) $\ln 2$ ۴) $2\ln 2$

۴۸- توان متوسط مقاومت 1Ω چه کسری از اندازه توان متوسط منبع است؟ (در حالت دائمی سینوسی)

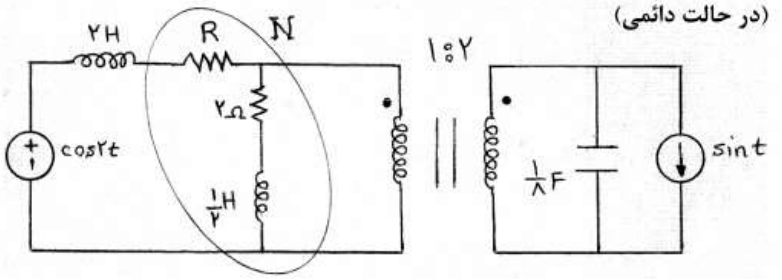


۱) $\frac{1}{2}$ ۲) $\frac{2}{3}$

۳) $\frac{3}{4}$ ۴) ۱

۴۹- به ازای چه مقدار **R** توان متوسط **N** ناشی از منبع ولتاژ ماکزیمم می‌شود؟

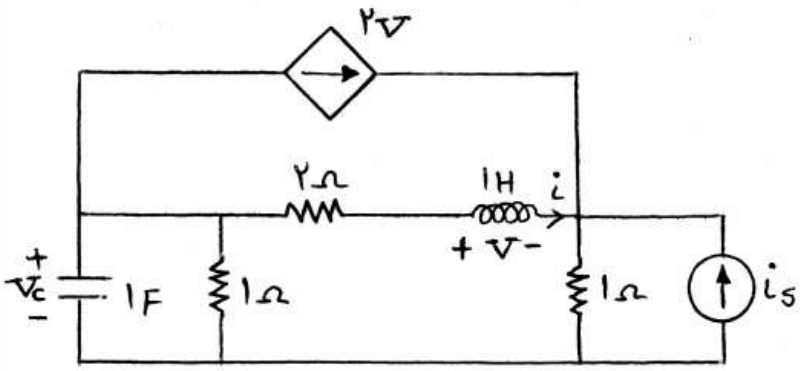
(در حالت دائمی)



۱) ۲ ۲) ۲/۵

۳) ۳ ۴) $\frac{\sqrt{۳۷}}{۲}$

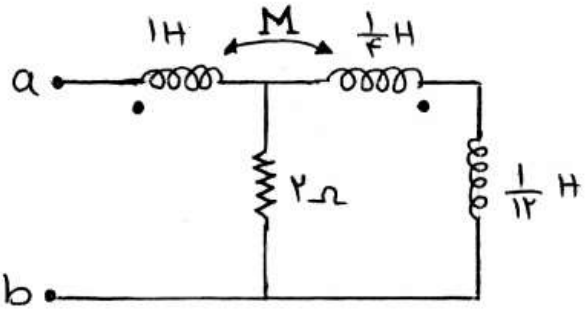
۵۰- در مدار زیر بردار حالت را به صورت $\mathbf{X(t)}=\begin{bmatrix}\mathbf{i(t)}\\ \mathbf{v_c(t)}\end{bmatrix}$ در نظر بگیرید. اگر معادلات حالت مدار به صورت $\dot{\mathbf{X}}=\mathbf{AX}+\mathbf{bi_S}$ باشد، ماتریس **A** کدام است؟



۱) $\begin{bmatrix}-۱ & \frac{۱}{۳}\\ ۱ & -\frac{۵}{۳}\end{bmatrix}$ ۲) $\begin{bmatrix}-۱ & \frac{۱}{۳}\\ -۱ & -\frac{۵}{۳}\end{bmatrix}$

۳) $\begin{bmatrix}-۱ & \frac{۱}{۲}\\ ۱ & -\frac{۵}{۳}\end{bmatrix}$ ۴) $\begin{bmatrix}-۱ & \frac{۱}{۲}\\ ۱ & \frac{۱}{۳}\end{bmatrix}$

۵۱- مقدار ضریب تزویج یا اندوکتانس متقابل (M) چند هانری باشد تا امپدانس دیده شده در وضعیت دائمی سینوسی از دو سر a و b سلفی خالص شود؟



۱) $\frac{1}{3}$

۲) $\frac{1}{2}$

۳) $\frac{2}{3}$

۴) به ازای هیچ مقدار M، امپدانس سلفی خالص نیست.

۵۲- پاسخ کامل یک مدار الکتریکی خطی و نامتغیر با زمان به ورودی پله واحد به ازای دو دسته شرایط اولیه مختلف x_1 و x_2 به قرار زیر است:

$$x_1(0)=\begin{bmatrix}1\\1\end{bmatrix}\rightarrow y_1(t)=\frac{1}{2}(1-e^{-t}+2e^{-2t})u(t)$$

$$x_2(0)=\begin{bmatrix}2\\2\end{bmatrix}\rightarrow y_2(t)=\frac{1}{2}(1-2e^{-t}+3e^{-2t})u(t)$$

پاسخ ضربه کدام است؟

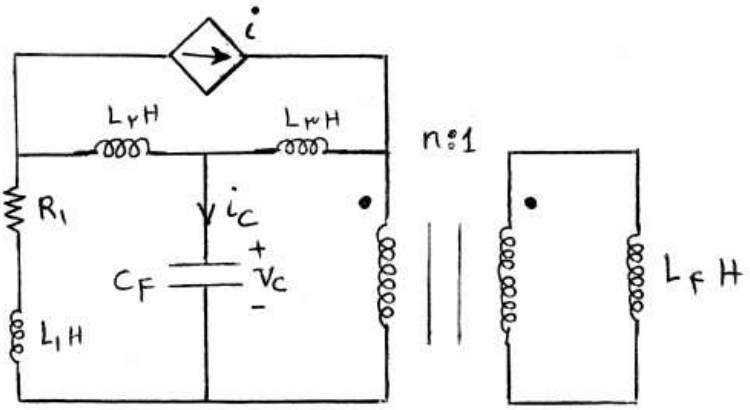
۱) $-\frac{1}{2}e^{-2t}u(t)$

۲) $-e^{-2t}u(t)+\delta(t)$

۳) $\frac{1}{2}(1+e^{-2t})u(t)$

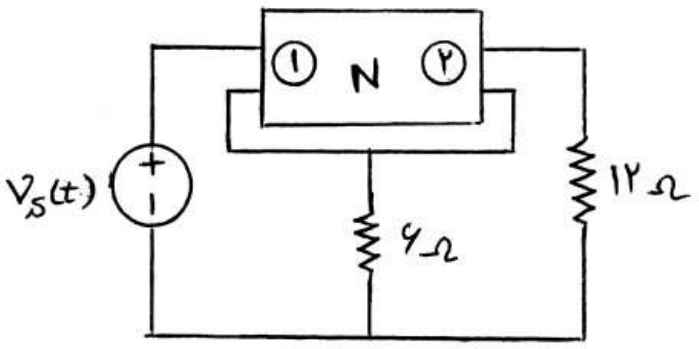
۴) $-\frac{1}{2}e^{-2t}u(t)+\delta(t)$

۵۳- در مدار زیر با تغییر منبع وابسته از $i = v_c$ به $i = i_c$ درجه مدار (تعداد فرکانس‌های طبیعی)



۱) تغییر نمی‌کند.
۲) از دو به سه تغییر می‌یابد.
۳) از چهار به سه تغییر می‌یابد.
۴) از سه به چهار تغییر می‌یابد.

۵۴- ماتریس امپدانس دو قطبی N به صورت $\begin{bmatrix} ۴s & ۳s \\ ۳s & ۹s \end{bmatrix}$ و منبع مستقل به صورت $v_s(t) = ۲۰\cos(۲t)$ است. امپدانس مدار از دو سر منبع مستقل برابر است با:



۱) $۱+۳j$
۲) $۲+۳j$
۳) $۶+۴j$
۴) $۴+۶j$