

परीक्षा दि: - 19-4-2014

CODE : 5

प्रश्नपुस्तिका
चाळणी परीक्षा
अणुविद्युत

प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

एकूण प्रश्न : 80
एकूण गुण : 200

वेळ : 3 (तीन) तास

सूचना

(1) सदर प्रश्नपुस्तिकेत 80 अनिवार्य प्रश्न आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. असा तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.

परीक्षा-क्रमांक									

केंद्राची संकेताक्षरे

शेवटचा अंक

(2) आपला परीक्षा-क्रमांक ह्या चौकोनांत न विसरता बॉलपेनने लिहावा.

(3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे न विसरता नमूद करावा.

(4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वांत योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.

(5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नाकडे वळावे. अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.

(6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही.

(7) प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवारांच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच "उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार पर्यायापैकी सर्वांत योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चार चुकीच्या उत्तरांसाठी एका प्रश्नाचे गुण वजा करण्यात येतील".

ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82" यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरुद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

SO3

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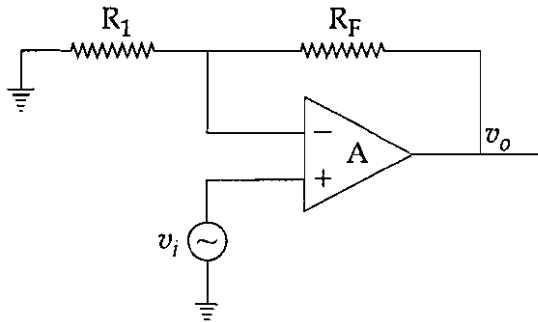
कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

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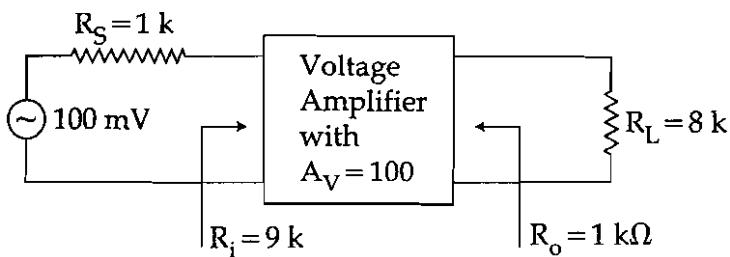
1. For the circuit shown below :



The type of feedback used is :

- (1) voltage shunt negative feedback.
- (2) current shunt negative feedback.
- (3) voltage series negative feedback.
- (4) current series negative feedback.

2. For the voltage amplifier shown in the figure, output voltage is :



- (1) 10 V (2) 5 V (3) 8 V (4) 6 V

3. In certain medium, $E = 5 \cos(10^8 t - 3y) \mathbf{a}_x \text{ V/m}$, then type of medium is :

- (1) free space
- (2) perfect dielectric
- (3) lossless dielectric
- (4) none of the above

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4. In BJT, collector current in active region is :
- (1) directly proportional to life time of minority charge carrier.
 - (2) inversely proportional to life time of minority charge carrier.
 - (3) independent of life time of minority charge carrier.
 - (4) none of the above
-
5. In BJT, parameter f_T is defined as the frequency at which :
- (1) voltage gain of amplifier falls by 3 dB from its low frequency value.
 - (2) short circuit common emitter current gain becomes unity.
 - (3) open circuit common emitter voltage gain becomes unity.
 - (4) short circuit current gain falls by 3 dB.
-
6. If $x(t) = 5 + \sin(50 \times 2\pi \times t) + 3 \cos(100 \times 2\pi \times t)$, then $x(t)$ is :
- (1) periodic with time period of 50 Hz.
 - (2) periodic with time period of 100 Hz.
 - (3) periodic with time period of 150 Hz.
 - (4) aperiodic.
-
7. Indirect frequency modulation is a process in which :
- (1) amplitude of carrier is varied in accordance with the instantaneous amplitude of modulating signal.
 - (2) phase of carrier is varied in accordance with the instantaneous amplitude of modulating signal.
 - (3) frequency of carrier is varied in accordance with the instantaneous amplitude of modulating signal.
 - (4) None of the above
-

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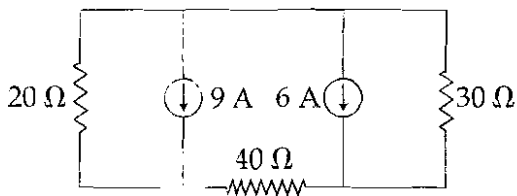
8. The dynamic range for 10 - bit sign - magnitude PCM code is :

- (1) 10 dB (2) 25 dB (3) 54 dB (4) 40 dB

9. The Boolean expression $(\bar{P} + PQ\bar{R} + P\bar{Q} + PQR)$ can be simplified to :

- (1) Q (2) R (3) \bar{P} (4) 1

10. In the circuit below, the voltage V across the 40Ω resistor would be equal to :



- (1) 80 V (2) 40 V (3) 160 V (4) zero

11. 24 telephone channels are frequency division multiplexed using an SSB modulation. Assuming 3 kHz per channel, the required bandwidth is :

- (1) 8 kHz (2) 27 kHz (3) 21 kHz (4) 72 kHz

12. A particular semiconductor in equilibrium has $5 \times 10^{15} \text{ cm}^{-3}$ donor atoms and $2 \times 10^{17} \text{ cm}^{-3}$ acceptor atoms. If the intrinsic carrier density (n_i) of the semiconductor is $2 \times 10^{12} \text{ cm}^{-3}$, then the electron density in it will be :

- (1) $2 \times 10^{17} \text{ cm}^{-3}$ (2) $5 \times 10^{15} \text{ cm}^{-3}$
 (3) $2 \times 10^7 \text{ cm}^{-3}$ (4) 10^7 cm^{-3}

13. How are the probabilities of an event E and its complement E^c in a sample space S related by ?

- (1) $P(E) = P(E^c)$ (2) $P(E) = 1 + P(E^c)$
 (3) $P(E) = 1 - P(E^c)$ (4) $P(E) = - P(E^c)$

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14. A system $y(t) = mx(t) + c$ is :

- (1) linear system.
- (2) non-linear system.
- (3) having zero response with zero input.
- (4) stable system with $x(t) = 5t$

where t is time.

15. MOS - 8 asynchronous counter is implemented using MS - JK flip flop. Each flip flop is having propagation delay of 10 ns. The maximum frequency at which this counter operates is :

- (1) 53 MHz
 - (2) 73 MHz
 - (3) 33 MHz
 - (4) 63 MHz
-

16. In 8085, the synchronization between the microprocessor and memory is done by :

- (1) ALE signal
 - (2) HOLD signal
 - (3) READY signal
 - (4) None of these
-

17. Adding an emitter resistor to a common emitter amplifier causes :

- (1) the current gain to increase and output resistance to decrease.
 - (2) the current gain to decrease and voltage gain to increase.
 - (3) the voltage gain to increase and input resistance to decrease.
 - (4) the voltage gain to decrease and input resistance to increase.
-

18. A parity generation circuit required to generate an even parity bit may use :

- (1) combination of EXOR and EXNOR gates.
 - (2) EXNOR gates only.
 - (3) EXOR gates only.
 - (4) AND and OR gates only.
-

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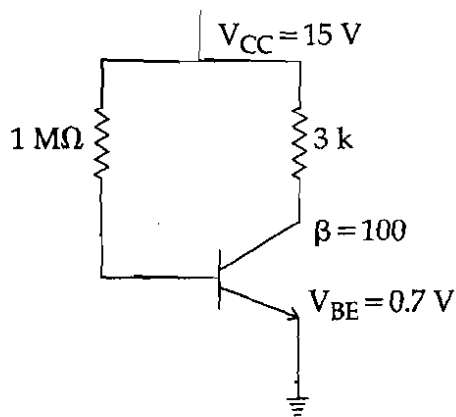
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19. If peak secondary voltage of Full wave rectifier is V_m then its DC output voltage is :

- (1) V_m (2) $2V_m$ (3) $\frac{V_m}{\pi}$ (4) $\frac{2V_m}{\pi}$
-

20. For the circuit shown below, Q point is given by :



- (1) 2 V, 3 mA (2) 5 V, 1 mA
(3) 7.5 V, 2.5 mA (4) 10.7 V, 1.43 mA
-

21. An electric field strength of $10\ \mu\text{V}/\text{m}$ is measured at an observation point $\theta = \frac{\pi}{2}$, 500 km from half - wave (resonant) dipole antenna operating in air at 50 MHz. The length of dipole is :

- (1) 6 m (2) 3 m (3) 9 m (4) 12 m
-

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22. In a minimum phase system :

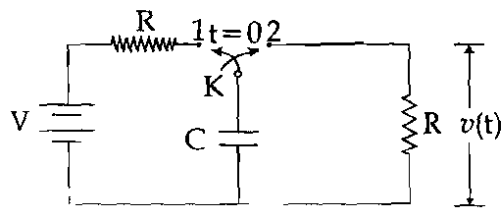
- (1) all poles lie in the left half plane.
- (2) all zeros lie in the left half plane.
- (3) all poles and zeros lie in the left half plane.
- (4) all except one pole or zero lie in the left half plane.

23. The number of loci in the root-locus plot of the discrete-time system with transfer function

$$GH(z) = \frac{K\left(z + \frac{1}{2}\right)}{z^2\left(z + \frac{1}{4}\right)} \text{ is :}$$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

24. For the network shown below, switch 'K' is at position '1' for longer time and it is connected to position '2' at $t = 0$, the voltage $v(t)$ for $t \geq 0$ is :



- (1) $v(t) = V\left(1 - e^{-t/RC}\right)$
- (2) $v(t) = V\left(e^{-t/RC}\right)$
- (3) $v(t) = V e^{-t/RC}$
- (4) $v(t) = V$

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25. An LTI system with flat magnitude response is producing constant time delay of ' τ ' seconds for all frequencies. If $h(t)$ is impulse response of the system, then :
- (1) $h(t)$ takes a maximum value at $t = \frac{\tau}{2}$.
(2) $h(t)$ takes a minimum value at $t = \frac{\tau}{2}$.
(3) $h(t)$ takes a maximum value at $t = \tau$.
(4) $h(t)$ takes a minimum value at $t = \tau$.
-
26. 64 : 1 MUX is to be constructed from 4 : 1 MUX. The minimum number of 4 : 1 MUX required are :
- (1) 16 (2) 32 (3) 21 (4) 25
-
27. A certain process described by $x(t) = A \sin(\omega_c t + \phi)$ is random process if :
- (1) A and ϕ are constants (2) A and ϕ are random variables
(3) A and ϕ are complex conjugates (4) None of the above
-
28. An optical fiber has a core with a refractive index of 1.45 and cladding with a refractive index of 1.42. The numerical aperture of the fiber is :
- (1) 0.12 (2) 0.18 (3) 0.29 (4) 0.38
-
29. Which type of flip flop is best suited for synchronous transfer of data from one flip flop to the other due to fewest interconnection requirement ?
- (1) T- flip flop (2) JK- flip flop
(3) D- flip flop (4) MS- JK flip flop
-

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30. Laplace transform of $3 \cos \omega t$ is :

- (1) $\frac{3\omega}{s^2 + \omega^2}$ (2) $\frac{3s}{s^2 + \omega^2}$ (3) $\frac{3s}{s^2 - \omega^2}$ (4) $\frac{s}{3(s^2 + \omega^2)}$
-

31. In AM-DSBFC system, transmitting antenna radiates 15 kW of power. If amplitude of modulating signal is equal to the amplitude of carrier signal, then carrier power is :

- (1) 10 W (2) 15 W (3) 20 W (4) 7 W
-

32. Which of the following is zero ?

- (1) grad div (2) div grad (3) curl grad (4) curl curl
-

33. The dominant mode for rectangular wave guides is :

- (1) TE_{11} (2) TM_{11} (3) TE_{101} (4) TE_{10}
-

34. Impulse response of a certain system is $h(t)$. If input of that system is $x(t)$ then output of the system is given by :

- (1) multiplication of $x(t)$ and $h(t)$ (2) addition of $x(t)$ and $h(t)$
(3) convolution of $x(t)$ and $h(t)$ (4) none of the above
-

35. Laplace transform $X(s)$ of signal $x(t)$ is :

- (1) $\int_{-\infty}^{\infty} x(t)e^{-st} dt$ (2) $\int_{-\infty}^{\infty} X(s)e^{-st} ds$
(3) $\int_{-\infty}^{\infty} x(t) dt$ (4) $\int_{-\infty}^{\infty} e^{-st} dt$
-

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Q3

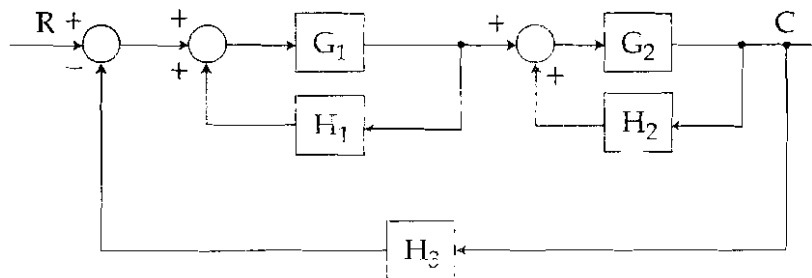
36. In the saturation region, the JFET transfer characteristics are :

- (1) exponential
- (2) linear
- (3) parabolic
- (4) hyperbolic

37. Magnetic flux over a surface having flux density B is given by :

- (1) $\phi = \iint \mathbf{B} \cdot d\mathbf{s}$
- (2) $\phi = \int \mathbf{B} \cdot d\mathbf{s}$
- (3) $\phi = \iiint \mathbf{B} \cdot d\mathbf{s}$
- (4) None of the above

38. The transfer function of the system as shown below with $H_1 = \frac{1}{G_1}$ and $H_2 = \frac{1}{G_2}$ is :



- (1) $\frac{G_1}{1 - H_1 G_1}$
- (2) $\frac{G_2}{1 - H_2 G_2}$
- (3) H_3
- (4) $\frac{1}{H_3}$

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39. For a network having resistors and independent sources, it is desired to obtain Thevenin equivalent across the load which is in parallel with an ideal current source. Then which of the following statements is true ?

- (1) The Thevenin equivalent circuit is simply that of a voltage source.
 - (2) The Thevenin equivalent circuit consists of a voltage source and a series resistor.
 - (3) The Thevenin equivalent circuit does not exist but the Norton equivalent does exist.
 - (4) None of these
-

40. The eigen value and corresponding eigen vector of matrix $B = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ is given by :

- (1) 2, $\begin{bmatrix} 3 \\ 0 \end{bmatrix}$ respectively
 - (2) 4, $\begin{bmatrix} 1 \\ -2 \end{bmatrix}$ respectively
 - (3) 6, $\begin{bmatrix} 4 \\ 1 \end{bmatrix}$ respectively
 - (4) None of the above
-

41. A transmission line is said to be distortionless line if :

- (1) attenuation constant ' α ' is frequency independent and phase constant ' β ' is linearly dependent on frequency.
 - (2) attenuation constant ' α ' is frequency dependent and phase constant ' β ' is frequency independent.
 - (3) both attenuation constant ' α ' and phase constant ' β ' are frequency dependent.
 - (4) both attenuation constant ' α ' and phase constant ' β ' are frequency independent.
-

SPACE FOR ROUGH WORK

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42. A system with lag compensation network :

- (1) increases system bandwidth. (2) decreases system bandwidth.
(3) does not affect system bandwidth. (4) None of the above.
-

43. Fan in of CMOS logic family is higher than that of TTL logic family because :

- (1) input resistance of MOSFET is more as compared to BJT.
(2) input resistance of BJT is more as compared to MOSFET.
(3) of output resistance of MOSFET.
(4) none of the above
-

44. Fourier transform of $\delta(t)$:

- (1) zero (2) 1 (3) $2\pi\delta(\omega)$ (4) $2\delta(\omega)$
-

45. At large forward biases, tunnel diodes conducts due :

- (1) avalanche multiplication in the space charge layer.
(2) the diffusion of carriers across the space charge layer.
(3) displacement currents of the diffusion capacitance.
(4) tunneling of carriers across the forbidden energy gap.
-

46. The skin depth in copper is :

- (1) directly proportional to frequency of EM wave.
(2) inversely proportional to frequency of EM wave.
(3) independent of frequency of EM wave.
(4) none of the above
-

SPACE FOR ROUGH WORK

P.T.O.

S03

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47. The system is BIBO stable and causal if the poles of system function $H(z)$ lie :

- (1) outside the unit circle of the z-plane.
 - (2) inside the unit circle of the z-plane.
 - (3) on the unit circle of the z-plane.
 - (4) Both (1) and (3)
-

48. Which one of the following methods is the multi-step method used for obtaining numerical solution of first order differential equations ?

- (1) Euler's method
 - (2) Improved Euler's method
 - (3) Runge-Kutta method
 - (4) Adams-Basford method
-

49. Foster - Seeley discriminator is used for :

- (1) AM modulation
 - (2) AM demodulation
 - (3) FM modulation
 - (4) FM demodulation
-

50. Reduced incidence matrix of certain network is shown below.

$$A = \begin{bmatrix} -1 & 1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 & 1 \end{bmatrix}$$

The eliminated row of the matrix is :

- (1) $[1 \ 0 \ 0 \ 1 \ 0 \ 1]$
 - (2) $[0 \ 0 \ 1 \ 1 \ 1 \ 0]$
 - (3) $[1 \ 0 \ 0 \ 0 \ -1 \ -1]$
 - (4) $[1 \ 1 \ 0 \ -1 \ 0 \ 1]$
-

SPACE FOR ROUGH WORK

A

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51. Which one of the following expressions is not Maxwell's equation for time - varying fields?

(1) $\nabla \cdot \mathbf{J} + \frac{\partial e_v}{\partial t} = 0$

(2) $\nabla \cdot \mathbf{D} = e_v$

(3) $\nabla \cdot \mathbf{E} = -\frac{\partial B}{\partial t}$

(4) $\oint \mathbf{B} \cdot d\mathbf{s} = 0$

52. The line integral $I = \int_C [x^2 y dx + (x - z) dy + xyz dz]$ where C is the arc of parabola $y = x^2$ in z plane from $A : (0, 0, 2)$ to $B : (1, 1, 2)$ is :

(1) $-\frac{15}{17}$

(2) $\frac{13}{15}$

(3) $-\frac{17}{15}$

(4) 0

53. Two dice are thrown. The probability that the sum on the dice is seven, is :

(1) $\frac{1}{5}$

(2) $\frac{1}{7}$

(3) $\frac{1}{6}$

(4) 1

54. The electrical power output of a photodiode is maximum when :

(1) small reverse bias exists across it.

(2) large reverse bias exists across it.

(3) small forward bias exists across it.

(4) small forward current flows through it irrespective of the bias.

55. According to Cauchy's Integral Theorem, if $f(z)$ is analytic in simply connected bounded domain D , then for every simple closed path C in D is :

(1) $\int_C f(z) dz = \infty$

(2) $\int_C f(z) dz = 0$

(3) $\int_C f(z) dz < \infty$

(4) $\int_C f(z) dz \neq 0$

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56. Which one of the following linear partial differential equations represents one dimensional wave equation ?

$$(1) \quad \frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

$$(2) \quad \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

$$(3) \quad \frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$$

$$(4) \quad \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$$

In all above equations 'c' is constant, 't' is time and x, y, z are Cartesian coordinates.

57. The data sheet of a certain 8-bit Analog to Digital Converter lists following specifications.

Resolution : 8-bit

Full-scale error : 0.02%

Full-scale analog input : +5 V.

The quantization error and total possible error are :

(1) 19.607 mV and 20.607 mV respectively.

(2) 20.607 mV and 19.607 mV respectively.

(3) 20.607 mV and 21.607 mV respectively.

(4) 19.607 mV and 18.607 mV respectively.

58. The range of 'K' for which the system represented by characteristic equation $S^4 + 6S^3 + 11S^2 + 6S + K = 0$ becomes stable, is :

(1) $K < 0$

(2) $10 < K < 20$

(3) $0 < K < 10$

(4) None of the above

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59. In a silicon p-n junction diode, contact potential :

- (1) decreases with increase in donor and acceptor atom concentration.
 - (2) increases with decrease in donor and acceptor atom concentration.
 - (3) remains independent of donor and acceptor atom concentration.
 - (4) increases with increase in donor and acceptor atom concentration
-

60. In JFET (n-channel) self bias circuit, voltage across source resistance is 2 V, and JFET is having $V_P = -4$ V and $I_{DSS} = 10$ mA. The drain current is equal to :

- (1) 2.5 mA (2) 5 mA (3) 7.5 mA (4) 10 mA
-

61. The rank of matrix $A = \begin{bmatrix} 3 & 0 & 2 & 2 \\ -1 & 7 & 4 & 9 \\ 7 & -7 & 0 & -5 \end{bmatrix}$ is :

- (1) 1 (2) 3 (3) 2 (4) 0
-

62. In two input CMOS NOR gate :

- (1) pull down network consists of series combination of two NMOS transistors while pull up network consists of parallel combination of two PMOS transistors.
 - (2) pull down network consists of parallel combination of two NMOS transistors while pull up network consists of series combination of two PMOS transistors.
 - (3) pull down and pull up network consists of parallel combination of two NMOS and PMOS transistors respectively.
 - (4) pull down and pull up network consists of series combination of NMOS and PMOS transistors respectively.
-

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63. The purpose of thick field oxide in MOSFET fabrication is :

- (1) to provide gate insulator MOSFET.
- (2) to provide isolation between MOSFETs.
- (3) to prevent breakdown of MOSFET.
- (4) to increase conductivity of MOSFET.

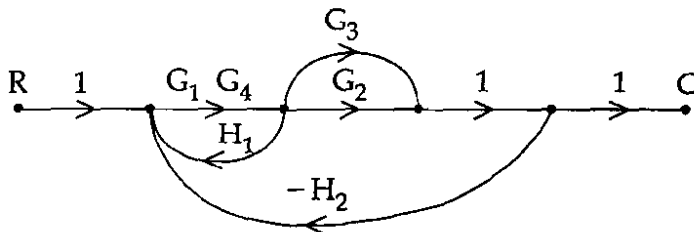
64. Diodes are used to clip voltage in circuits because they act as :

- (1) current sources under certain bias conditions.
- (2) voltage sources under certain bias conditions.
- (3) inductors that can remove current spikes.
- (4) dependent current sources whose current is clipped by the load resistor value.

65. In the Wein bridge oscillator, phase shift provided by Amplifier and feedback network for sustained oscillation is :

- (1) 180° and 180° respectively
- (2) 0° and 180° respectively
- (3) 360° and 0° respectively
- (4) 180° and 0° respectively

66. The transfer function for a system with its signal flow diagram as shown below is :



- (1)
$$\frac{G_2 G_3 (G_1 + G_4)}{1 + G_1 G_4 H_1 + G_1 G_2 G_4 H_2 + G_1 G_3 G_4 H_2}$$
- (2)
$$\frac{G_1 G_4 (G_2 + G_3)}{1 - G_1 G_4 H_1 + G_1 G_2 G_4 H_2 + G_1 G_3 G_4 H_2}$$
- (3)
$$\frac{G_1 G_2 G_3 G_4}{1 + G_1 G_2 G_4 H_2 - G_1 G_3 G_4 H_2}$$
- (4)
$$\frac{G_1 G_3 (G_2 + G_4)}{1 - G_1 G_4 H_1 + G_1 G_2 G_4 H_2 + G_1 G_3 G_4 H_2}$$

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67. In superhetrodyne receiver RF and IF frequencies are 1055 kHz and 455 kHz respectively. The image frequency of the receiver is :

- (1) 600 kHz (2) 1510 kHz (3) 910 kHz (4) 1055 kHz
-

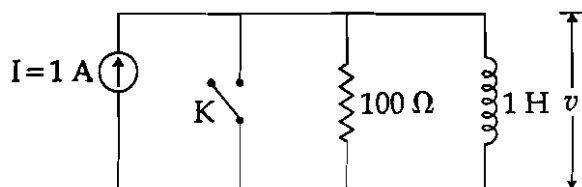
68. In n-channel Enhancement MOSFET, threshold voltage :

- (1) increases with increase in substrate concentration.
(2) decreases with increase in substrate concentration.
(3) increases with decrease in substrate concentration.
(4) remains independent of substrate concentration.
-

69. Given that $x(t) \xrightarrow{\text{L.T.}} X(s)$, the Inverse Laplace transform of $-\frac{d}{dt}X(s)$ is :

- (1) $-\frac{d}{dt}x(t)$ (2) $-tx(t)$ (3) $\frac{d}{dt}x(t)$ (4) $tx(t)$
-

70. The network shown in the figure has the switch 'K' opened at $t = 0$. The voltage ' v ' just after the switch is opened i.e. at $t = 0+$ is :



- (1) 0 V (2) 10 V (3) 100 V (4) 50 V
-

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71. If a sinusoidal source is connected to a network of linear passive elements, then every voltage and current in that network in the steady state is :

- (1) sinusoidal with same frequency, amplitude and phase.
 - (2) sinusoidal with same frequency as that of source but with different amplitude and phase.
 - (3) sinusoidal with different frequency, amplitude and phase.
 - (4) none of the above
-

72. Solution of differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$ with initial conditions $y(0) = 4$ and

$$\left. \frac{dy}{dx} \right|_{x=0} = 1 \text{ is :}$$

- (1) $y(x) = 4e^x - e^{-2x}$
 - (2) $y(x) = 3e^x + e^{-2x}$
 - (3) $y(x) = e^x - 4e^{-2x}$
 - (4) $y(x) = 2e^x - 3e^{-2x}$
-

73. In n-tub CMOS process :

- (1) NMOS is fabricated in native substrate and PMOS is fabricated in tub.
 - (2) PMOS is fabricated in native substrate and NMOS is fabricated in tub.
 - (3) NMOS and PMOS both are fabricated in native substrate.
 - (4) NMOS and PMOS both are fabricated in tub.
-

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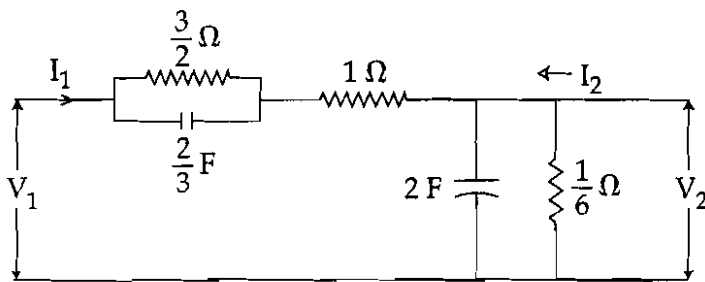
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74. N-point DFT of $X[n] = u[n] - u[n - N]$ is :

- (1) $X[k] = \begin{cases} 0 & \text{for } k \neq 0 \\ N & \text{for } k = 0 \end{cases}$
- (2) $X[k] = 0$ for all k
- (3) $X[k] = N$ for all k
- (4) $X[k] = \begin{cases} N & \text{for all } k \neq 0 \\ 0 & \text{for } k = 0 \end{cases}$

75. For the network shown below,



$$y_{12} = \frac{K(s+1)}{(s+2)(s+4)}$$

then value of K is :

- (1) 2
- (2) 3
- (3) -3
- (4) None of the above

76. A graph with 'n' nodes is tree if and only if it is connected and has :

- (1) n - 2 branches/edges
- (2) n branches/edges
- (3) n + 1 branches/edges
- (4) n - 1 branches/edges

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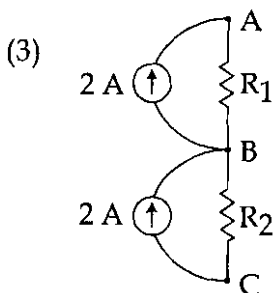
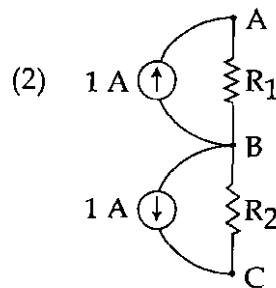
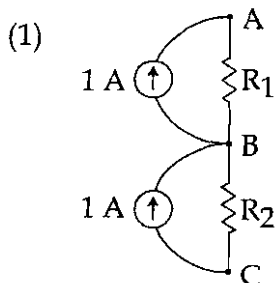
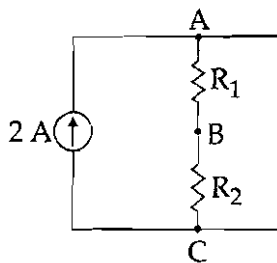
77. For distortionless transmission through an LTI system amplitude $H(\omega)$ is :

- (1) constant
- (2) one
- (3) zero
- (4) linearly dependent on ω

78. A telephone line has bandwidth of 3.2 kHz and signal-to-noise ratio of 35 dB. The maximum theoretical data rate is :

- (1) 37.2 kb/sec
- (2) 50.2 kb/sec
- (3) 70 kb/sec
- (4) 80 kb/sec

79. Equivalent circuit of the network shown below is :



(4) None of the above

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80. PID controlled system has :

- (1) P and I actions in forward path and D action in feedback path.
 - (2) P and I actions in feedback path and D action in forward path.
 - (3) All the three i.e. P, I and D actions in forward path.
 - (4) All three i.e. P, I and D actions in feedback path.
-

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सूचना — (पृष्ठ 1 वरून पुढे....)

- (8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82" यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.
- (9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वतःबरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. मात्र परीक्षा कक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.

नमुना प्रश्न

Pick out the correct word to fill in the blank :

Q. No. 201. I congratulate you _____ your grand success.

- (1) for (2) at (3) on (4) about

ह्या प्रश्नाचे योग्य उत्तर "(3) on" असे आहे. त्यामुळे या प्रश्नाचे उत्तर "(3)" होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक "③" हे वर्तुळ पूर्णपणे छायंकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201. ① ② ● ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तरक्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायंकित करून दाखवावा. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.

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