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UTTAR PRADESH

PUBLIC SERVICE COMMISSION 2021

Assistant Engineer

Electrical Engineering

PAPER-I

Exam held on 29-05-2022

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Questions and Answer Keys

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UPPSC - 2021

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Q.1 निम्नलिखित में से तद्भव शब्द हैं

- (a) मयंक (b) संतान
(c) वानर (d) धूलि

Ans. (a)

Q.2 'समाज' शब्द में कौन-सा प्रत्यय जोड़कर 'सामाजिक' शब्द बना है?

- (a) ईय (b) इत
(c) ई (d) इक

Ans. (d)

Q.3 इनमें से 'मोर' का पर्यायवाची शब्द है

- (a) अरुणशिखा (b) वारक
(c) ताम्रचूड़ (d) कलापी

Ans. (d)

Q.4 निम्नलिखित वर्गों में 'चन्द्रमा' के सभी पर्यायवाची शब्द किस वर्ग में शुद्ध हैं?

- (a) हिमांशु, सुधांशु, सुधाकर
(b) चाँद, हिमांशु, अर्कजा
(c) चाँद, हिमांशु, पारावार
(d) चाँद, हिमांशु, पद्माकर

Ans. (a)

Q.5 'वह कौन-सा मनुष्य है, जिसने महाप्रतापी भोज का नाम न सुना हो' – यह वाक्य है

- (a) समानाधिकरण वाक्य
(b) साधारण वाक्य
(c) मिश्र वाक्य
(d) संयुक्त वाक्य

Ans. (c)

Q.6 एक शब्द में महाप्राण व्यंजनों का प्रयोग नहीं हुआ है

- (a) जोगन (b) घाघ
(c) झूठ (d) खीझ

Ans. (a)

Q.7 'पर्वत के ऊपर की समतल भूमि' के लिए एक शब्द है

- (a) उपत्यका (b) पहाड़
(c) अधित्यका (d) पठार

Ans. (c)

Q.8 'पाण्डव' शब्द में इनमें से प्रयुक्त प्रत्यय है

- (a) अव (b) व
(c) अ (d) इनमें से कोई नहीं

Ans. (c)

Q.9 इनमें से तत्सम और तद्भव का एक युग्म गलत है

- (a) प्रिय – प्रिया (b) चुल्लि: – चूल्हा
(c) शक्तु – सत्तू (d) खर्पर – खपरा

Ans. (a)

Q.10 निम्नलिखित में से शुद्ध वर्तनी वाला शब्द है

- (a) अनुग्रहित (b) अनग्रहीत
(c) अग्रहित (d) अनुगृहीत

Ans. (d)

Q.11 अधोलिखित शब्द – युग्मों में से कौन-सा शुद्ध है?

- (a) पति – पत्नी (b) पति – पत्नि
(c) पती – पतनी (d) पती – पत्नी

Ans. (a)

Q.12 अनेकार्थी शब्द 'अक्षर' का इनमें से एक अर्थ नहीं है

- (a) अंक (b) वर्ण
(c) मोक्ष (d) अविनाशी

Ans. (a)

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ME: 16th June, 2022

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Q.13 किस वर्ग की सभी ध्वनियाँ मूर्धन्य हैं?

- (a) ट, ठ, ड, ढ, ष
 (b) क, च, ट, त, प
 (c) ट, ठ, ड, श, स्
 (d) ख, छ, व, थ, फ

Ans. (a)

Q.14 अर्थ और प्रयोग की दृष्टि से एक मुहावरा गलत है

- (a) खाक छानना— दर—दर भटकना।
 प्रयोग— राम ने पहले तो पढ़ाई नहीं की, अब नौकरी के लिए खाक छान रहा है।
 (b) आस्तीन का साँप — धोखबाज
 प्रयोग— मैं जिसे अपना मित्र समझता था, वह आस्तीन का साँप निकला।
 (c) ओखली में सिर देना — जान—बूझकर विपत्ति में फँसना।
 प्रयोग— उसे कितना समझाया था कि रामसेवक के साथ मिलकर खेती मत करो लेकिन वह माना ही नहीं। उसने जान—बूझकर ओखली में सिर दे ही दिया।
 (d) हाथ मलना — हाथ साफ करना।
 प्रयोग— कड़ाके की सर्दी में वह अपने हाथ मल रहा था।

Ans. (d)

Q.15 किस वाक्य में सकर्मक क्रिया है?

- (a) श्याम खाता है।
 (b) साँप सरकता है।
 (c) सूरज निकलता है।
 (d) गाय बैठती है।

Ans. (c)

Q.16 'साझे की हाँड़ी चौराहे फूटी' कहावत का अर्थ है

- (a) भ्रमण पर जाने से कार्य बिगड़ जाता है।
 (b) जिम्मेदारी एक व्यक्ति की हो, अन्यथा कार्य बिगड़ जाता है।

(c) सावधानी से कार्य करना।

(d) सभी बिना जवाबदेही के कार्य करें तो सफलता हाथ लगती है।

Ans. (b)

Q.17 'अश्व' का पर्यायवाची शब्द नहीं है

- (a) वाजि (b) सैधव
 (c) वैशाखनन्दन (d) हय

Ans. (c)

Q.18 'वह (व्यक्ति) जिसने संन्यास ग्रहण किया हो' — इस वाक्यांश के लिए एक शब्द है

- (a) प्रव्राज (b) प्रव्रजित
 (c) प्रव्रजित (d) प्रशमित

Ans. (c)

Q.19 निम्नांकित शब्द — युग्मों में से विलोम शब्दों की दृष्टि से एक युग्म गलत है, वह है

- (a) हयादार — बेहया
 (b) अभिमानी — निरभिमान
 (c) अज्ञ — अनभिज्ञ
 (d) सुशासन — कुशासन

Ans. (c)

Q.20 निम्नलिखित में से वर्तनी की दृष्टि से कौन—सा शब्द सही नहीं है?

- (a) प्रातिनिधिक (b) आधीन
 (c) आध्यात्मिक (d) आभ्यन्तरिक

Ans. (b)

Q.21 इनमें से 'अग्नि' का पर्यायवाची शब्द नहीं है

- (a) जातवेद (b) वैश्वानर
 (c) कान्तार (d) शाण्डिल्य

Ans. (c)

Q.22 निम्नलिखित में से एक का अर्थ 'पाँवों की आहट' भी है

- (a) शरासन (b) कमान
 (c) धनुष (d) चाप

Ans. (a)

Q.23 निम्नलिखित शब्दों में से एक में उपसर्ग का प्रयोग नहीं है

- (a) कुडंग (b) कुतरना
(c) कुठौर (d) कुर्तक

Ans. (b)

Q.24 निम्नलिखित में से कौन-सा विशेषण शब्द है?

- (a) भालू (b) आलू
(c) ढालू (d) बालू

Ans. (c)

Q.25 अधोलिखित में से 'नदी' के पर्यायवाची किस वर्ग में नहीं है?

- (a) तरंगिणी, सरिता
(b) निम्नगा, तरंगिणी
(c) आपगा, तटिनी
(d) जाहनवी, यियामा

Ans. (d)

Q.26 Match the items in List-I and List-II and choose correct answer from the given code :

List-I

- A. Copper loss
B. Eddy current loop
C. Hysteresis loss
D. Windage loss

List-II

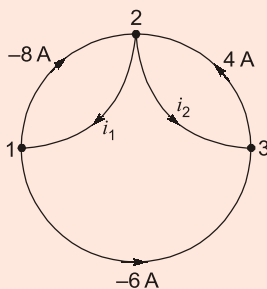
1. $\eta(B_{\max})^{1.6}fv$
2. αN^2
3. I^2R
4. $k(B_{\max})^2 f^2 vt^2$

Code :

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 4 | 1 | 2 |
| (b) | 3 | 1 | 4 | 2 |
| (c) | 4 | 3 | 1 | 2 |
| (d) | 3 | 4 | 2 | 1 |

Ans. (a)

Q.27 The values of current i_1 and i_2 in the circuit figure given below are :



- (a) 14 A, 10 A (b) -14 A, 10 A
(c) 14 A, -10 A (d) -14 A, -10 A

Ans. (b)

Q.28 The inverse fourier transform of $\delta(\omega)$ is

- (a) $\frac{1}{2\pi}$ (b) 1
(c) $\delta(t)$ (d) $u(t)$

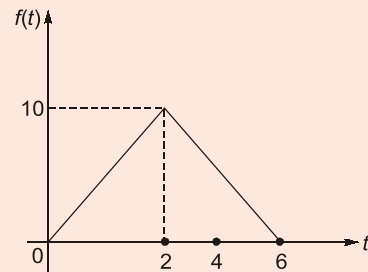
Ans. (a)

Q.29 The worst type of load on a supply system is

- (a) pumping load
(b) rolling mill load
(c) motors in a paper mill
(d) arc furnace load

Ans. (d)

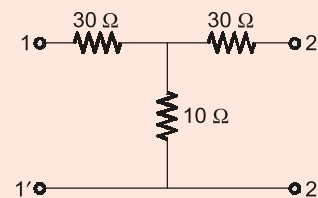
Q.30 The Laplace transform of the wave form shown below in the figure, is



- (a) $\frac{5}{s} + 7.5 \frac{e^{-2s}}{s^2} - 2.5 \frac{e^{-6s}}{s^2}$
(b) $\frac{5}{s} - 7.5 \frac{e^{-2s}}{s^2} + 2.5 \frac{e^{-6s}}{s^2}$
(c) $\frac{5}{s} + 7.5 \frac{e^{-2s}}{s^2} + 2.5 \frac{e^{-6s}}{s^2}$
(d) $\frac{5}{s} - 7.5 \frac{e^{-2s}}{s^2} - 2.5 \frac{e^{-6s}}{s^2}$

Ans. (*)

Q.31 For the symmetrical 2-port network given below the transmission parameter 'A' is



- (a) $\frac{1}{4} \Omega$ (b) 1Ω
 (c) 4Ω (d) None of the above

Ans. (c)

Q.32 The most suitable motor for urban and sub-urban services of electric traction is

- (a) Three phases synchronous motor
 (b) Separately excited DC motor
 (c) Three phase induction motor
 (d) DC series motor

Ans. (d)

Q.33 At slack bus, the combinations of variables specified for load flow study is

- (a) $Q, |V|$ (b) $|V|, \delta$
 (c) $P, |V|$ (d) P, Q

Ans. (b)

Q.34 For a transmission line if $\frac{L}{C} = \frac{R}{G}$ then incorrect statement is

- (a) The line is lossless
 (b) $Z_0^2 = \frac{R}{G}$
 (c) If a series of pulses are transmitted they arrive undistorted
 (d) The line is called distortionless line.

Ans. (a)

Q.35 Load flow study is carried out for

- (a) Load frequency control
 (b) Fault calculations
 (c) System planning
 (d) Stability studies

Ans. (c)

Q.36 In cylindrical co-ordinates the equation

$$\frac{1}{\rho} \frac{\partial}{\partial \rho} \left(\rho \frac{\partial V}{\partial \rho} \right) + \frac{1}{\rho^2} \frac{\partial^2 V}{\partial \phi^2} = 0 \text{ if}$$

- (a) Poisson's equation with no Z dependence
 (b) Laplace's equation with no Z dependence
 (c) Euler's equation with no Z dependence
 (d) None of the above

Ans. (b)

Q.37 A 50 MVA, 11 kV, 3-phase generator has a stored energy of 400 MJ. Its inertia constant is

- (a) 16 MVA/MJ (b) 4 MJ/MVA
 (c) 2 MVA/MJ (d) 8 MJ/MVA

Ans. (d)

Q.38 Which of these is NOT valid at point $p(0, 4, 0)$?

- (a) $a_p = -a_y$ (b) $a_\phi = -a_x$
 (c) $a_r = 4a_y$ (d) $a_\theta = -a_x$

Ans. (c)

Q.39 Transmission lines are transposed to

- (a) Reduce interference with neighbouring communication lines
 (b) Reduce Ferranti effect
 (c) Reduce transmission loss
 (d) Reduce skin effect

Ans. (a)

Q.40 Ohm's law in point form in field theory can be expressed as

- (a) $R = \frac{\rho l}{A}$ (b) $V = RI$
 (c) $\bar{J} = \sigma \bar{E}$ (d) $\bar{J} = \frac{\bar{E}}{\sigma}$

Ans. (c)

Q.41 Ideally the voltage drop across a conducting diode must be

- (a) Equal to forward biased voltage
 (b) ∞
 (c) Higher than the forward biased voltage
 (d) 0

Ans. (d)

Q.42 If the Nyquist plot cuts the negative real axis at a distance of 0.8, then the gain margin of the system is

- (a) 1.25 (b) 0.8
 (c) 2.25 (d) -0.8

Ans. (a)

Q.43 Turn-on time of a transistor used in switching mode is

- (a) Sum of rise time and fall time
- (b) Sum of delay time and rise time
- (c) Sum of delay time and storage time
- (d) Sum of rise time and storage time

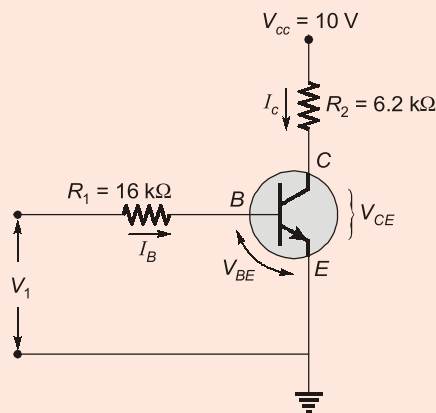
Ans. (b)

Q.44 The transfer function of a low pass RC network is

- (a) $\frac{s}{(1+RCs)}$ (b) $RCs(1+RCs)$
- (c) $\frac{RC}{(1+RCs)}$ (d) $\frac{1}{(1+RCs)}$

Ans. (d)

Q.45 In an n-p-n CE configuration BJT, when $V_{cc} = 10$ V, $R_1 = 16$ k Ω , $R_2 = 6.2$ k Ω and $\beta_{dc} = 20$, to switch a BJT into saturation (on state), the minimum input voltage will be



- (a) 2.55 V (b) 1.78 V
- (c) 1.99 V (d) 2.57 V

Ans. (c)

Q.46 Match List-I with List-II and select the correct answer from the following options :

List-I

- A. $\xi = 0$
- B. $0 < \xi < 1$
- C. $\xi = 1$
- D. $\xi > 1$

List-II

- 1. Roots are real and equal.
- 2. Roots are real and unequal.
- 3. Roots are complex conjugate.
- 4. Roots are purely imaginary.

Codes :

	A	B	C	D
(a)	2	1	4	3
(b)	4	3	1	2
(c)	2	3	4	1
(d)	4	1	3	2

Ans. (b)

Q.47 A Schmitt trigger converts slowly varying wave form into

- (a) Square wave (b) Sine wave
- (c) Triangular wave (d) Sawtooth wave

Ans. (a)

Q.48 The system matrix of a linear time invariant continuous time system is given by

$$A = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix}$$

Roots of the characteristic

equation are

- (a) 0, -1 (b) -1, -4
- (c) -4, -5 (d) -1, -5

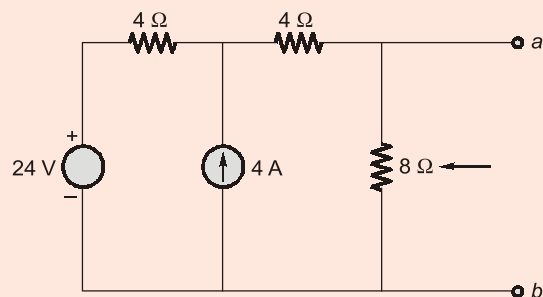
Ans. (b)

Q.49 Zener diode is used as the main component in dc power supply for

- (a) Voltage regulation
- (b) Rectification
- (c) Conversion from AC to DC
- (d) Filtration

Ans. (a)

Q.50 Applying Norton's theorem, the Norton's equivalent circuit to the left of the terminals a and b in the below circuit is having equivalent current source (I_N) and equivalent parallel resistance (R_N) as



- (a) $I_N = 4 \text{ A}$, $R_N = 3.0 \Omega$
 (b) $I_N = 4 \text{ A}$, $R_N = 60 \Omega$
 (c) $I_N = 9 \text{ A}$, $R_N = 1.6 \Omega$
 (d) $I_N = 5 \text{ A}$, $R_N = 4 \Omega$

Ans. (d)

- Q.51** An induction motor and synchronous motor are connected to a common feeder line. To operate the feeder line at unity power factor, the synchronous motor should be
- (a) Disconnected from common terminal
 (b) Under excited
 (c) Normal excited
 (d) Over excited

Ans. (d)

- Q.52** Kirchhoff's current and Kirchhoff's voltage laws (KCL and KVL) apply to
- (a) Linear circuits only
 (b) DC circuits only
 (c) Both DC and AC circuits
 (d) AC circuits only

Ans. (c)

- Q.53** In case of a 100 kVA transformer with iron loss of 1 kW and full-load copper loss of 2 kW, the load at which maximum efficiency occurs is
- (a) 25.2 kVA (b) 100 kVA
 (c) 50.5 kVA (d) 70.7 kVA

Ans. (d)

- Q.54** Z-transform of $x[n] = e^{-(n/40)}u(n)$ is

- (a) $\frac{Z}{Z + e^{-(\frac{1}{40})}}$ (b) $\frac{Z}{Z - e^{-(\frac{1}{40})}}$
 (c) $\frac{Z}{Z + e^{-(\frac{1}{40})}}$ (d) $\frac{Z}{Z - e^{-(\frac{1}{40})}}$

Ans. (b)

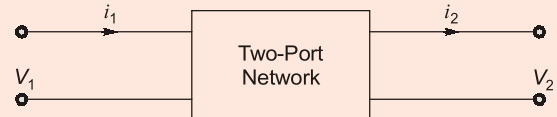
- Q.55** A 10 kVA, 440 V/220 V, 50 Hz single phase transformer gave the following test results conducted on high voltage side :
- Open circuit test : 440 V, 1.0 A, 100 W
 Short circuit test : 20 V, 22.7 A, 130 W

The efficiency at 0.8 pf lagging is

- (a) 97.2% (b) 96.2%
 (c) 98.2% (d) 95.2%

Ans. (c)

- Q.56** The terminal voltage and currents of a two-port network are indicated in the figure below. If the two-port network is reciprocal, then



- (a) $AD - BC = 0$ (b) $\frac{Z_{12}}{Y_{12}} = Z_{12}^2 - Z_{11}Z_{22}$

- (c) $h_{12} = -h_{21}$ (d) $Z_{12} = \frac{1}{Y_{22}}$

Ans. (c)

- Q.57** Given below are two statements, one is labelled as Assertion (A) and other Reason (R) :

Assertion (A) : The short circuit ratio of a three phase alternator should be high.

Reason (R) : A high value of SCR will decrease the value of voltage regulation.

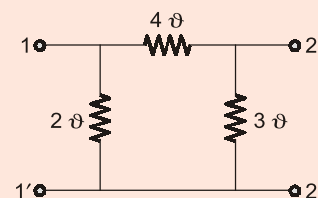
Select the correct answer using code given below :

Code :

- (a) (A) is false but (R) is true.
 (b) Both (A) and (R) are true and (A) is correct explanation of (R).
 (c) (A) is true but (R) is false.
 (d) Both (A) and (R) are true but (A) is not correct explanation of (R).

Ans. (b)

- Q.58** For the network shown below, the transfer admittance is



- (a) $-9 \bar{U}$ (b) $-2 \bar{U}$
 (c) $-4 \bar{U}$ (d) $-3 \bar{U}$

Ans. (c)

- Q.59** The speed of a DC motor can be controlled by changing
 (a) armature resistance
 (b) its flux
 (c) applied voltage
 (d) all of the above

Ans. (d)

Q.60 The vector statement of Gauss's law is

- (a) $\oint_S D \cdot da = \oint_V \rho dV$
 (b) $\oint_V D \cdot da = \oint_S \sigma dV$
 (c) $\iint_S D \cdot da = \int_V \rho^2 dV$
 (d) $\int_V D \cdot da = \oint_S \rho dV$

Ans. (a)

Q.61 Match List-I and List-II and answer with code given below :

List-I

- A. High-Pass RC circuit
 B. Low-Pass RC circuit
 C. Clamping circuit
 D. Clipping circuit

List-II

1. Compensator
 2. DC restorer
 3. Integrator
 4. Differentiator
 5. Compensated attenuator

Codes :

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 3 | 2 | 1 |
| (b) | 5 | 4 | 2 | 1 |
| (c) | 5 | 4 | 1 | 2 |
| (d) | 4 | 3 | 1 | 2 |

Ans. (a)

Q.62 The frequency of the power wave, associated with an electromagnetic wave, having a field as

$$E = e^{-\frac{1}{\delta}} \cos\left(\omega t - \frac{Z}{\delta}\right), \text{ is given by}$$

- (a) $\frac{\omega}{2\pi}$ (b) $\frac{\omega}{8\pi}$
 (c) $\frac{\omega}{\pi}$ (d) $\frac{\omega}{4\pi}$

Ans. (a)

Q.63 Three resistances each of R ohm are connected in delta, its equivalent star will comprise three resistances each of values

- (a) $\frac{R}{2} \Omega$ (b) $3R \Omega$
 (c) $\frac{R}{3} \Omega$ (d) $2R \Omega$

Ans. (c)

Q.64 A DC shunt generator supplies a load of 7.5 kW at 200 V. The armature resistance is 0.6Ω and field resistance is 80 ohms. The generated emf is

- (a) 202 V (b) 224 V
 (c) 123.5 V (d) 448 V

Ans. (b)

Q.65 The ratio of charge stored by two metallic spheres is raised to the same potential is 6. The ratio of the surface areas of the sphere is

- (a) $\frac{1}{\sqrt{6}}$ (b) 6
 (c) 36 (d) $\frac{1}{6}$

Ans. (c)

Q.66 The voltage reflection coefficient of a short circuited line is

- (a) 0 (b) -1
 (c) 0.5 (d) 1

Ans. (b)

Q.67 When a lossy capacitor with a dielectric of permittivity ϵ and conductivity σ operates at a frequency ω , the loss tangent for the capacitor is given by

- (a) $\frac{\sigma}{\omega \epsilon}$ (b) $\frac{\omega \sigma}{\epsilon}$
 (c) $\sigma \omega \epsilon$ (d) $\frac{\omega \epsilon}{\sigma}$

Ans. (a)

Q.68 The condition for reciprocity for a two-port transmission network is expressed by

- (a) $\begin{vmatrix} A & B \\ C & D \end{vmatrix} = 1$ (b) $\begin{vmatrix} A & B \\ C & D \end{vmatrix} = 0$
 (c) $\begin{vmatrix} A & C \\ B & D \end{vmatrix} = 0$ (d) $\begin{vmatrix} A & D \\ B & C \end{vmatrix} = 1$

Ans. (a)

Q.69 When a two winding transformer is connected as an auto transformer, its efficiency at full load

- (a) Increases by 50%
 (b) Decreases
 (c) Remains same
 (d) Increases

Ans. (d)

Q.70 The forbidden energy gap in silicon at 300°K is

- (a) 1.41 eV (b) 0.72 eV
 (c) 1.1 eV (d) 0.785 eV

Ans. (c)

Q.71 A complex current wave is given by :

$i = 5 + 5 \sin 100 \pi t$ ampere. Its average value is

- (a) 5 A (b) 10 A
 (c) $\sqrt{5}$ A (d) 0 A

Ans. (a)

Q.72 The total reactance and total susceptance of a lossless overhead EHV line, operating at 50 Hz, are given by 0.045 p.u. and 1.2 p.u. respectively. If the velocity of wave propagation is 3×10^5 km/s, then the approximation length of the line is

- (a) 272 km (b) 122 km
 (c) 222 km (d) 172 km

Ans. (c)

Q.73 If $L[f(t)] = \frac{2(s+1)}{s^2 + 2s + 5}$, then $f(0^+)$ and $f(\infty)$ are given by

- (a) $\frac{2}{5}, 0$ respectively
 (b) 0, 2 respectively
 (c) 0, 1 respectively
 (d) 2, 0 respectively

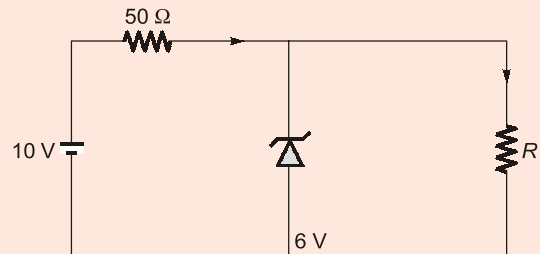
Ans. (d)

Q.74 Which one of the following effects in the system is NOT caused by negative feedback?

- (a) Reduction in output impedance
 (b) Reduction in gain
 (c) Increase in distortion
 (d) Increase in bandwidth

Ans. (c)

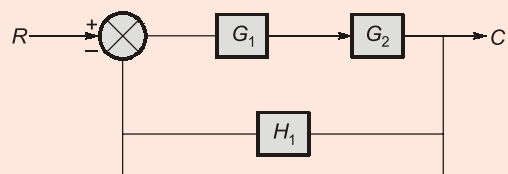
Q.75 The 6 V zener diode shown in the figure has zero zener resistance and a knee current of 5 mA. The minimum value of R, so that the voltage across it does not fall below 6 V, is



- (a) Zero (b) 1.2 k Ω
 (c) 50 Ω (d) 80 Ω

Ans. (d)

Q.76 The transfer function of the system shown below is



- (a) $\frac{G_1 G_2}{1 + G_1 G_2 + H_1}$ (b) $\frac{G_1 G_2}{1 + G_1 G_2 + G_1 G_2 H_1}$
 (c) $\frac{G_1 G_2}{1 + H_1 G_1 G_2}$ (d) $\frac{G_1 G_2}{1 + G_1 G_2 + G_1 H_1}$

Ans. (b)

Q.77 A transformer is rated at 11 kV/0.4 kV, 500 kVA, 5% reactance. The short circuit MVA of the transformer when connected to an infinite bus is

- (a) 1 MVA (b) 10 MVA
 (c) 100 MVA (d) None of the above

Ans. (b)

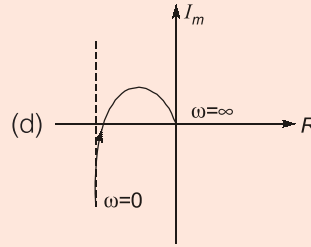
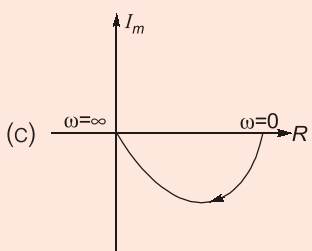
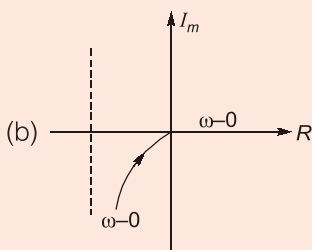
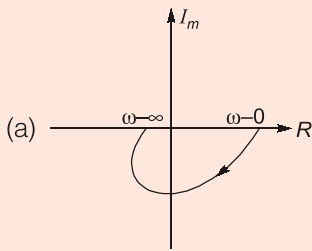
Q.78 In the general form of first causer network, if pole at infinitely then first element be

- (a) a shunt capacitor
 (b) a series inductor
 (c) a series capacitor
 (d) a shunt inductor

Ans. (b)

Q.79 Polar plot of transfer function is $Q(j\omega) =$

$$\frac{1}{j\omega(1 + j\omega T_1)}$$



Ans. (b)

Q.80 The leakage resistance of a 50 km long cable is 1 MΩ. For a 100 km long cable it will be

- (a) 4 MΩ (b) 0.5 MΩ
 (c) 2 MΩ (d) 1 MΩ

Ans. (b)

Q.81 Match the following and choose correct alternative from List-I and List-II.

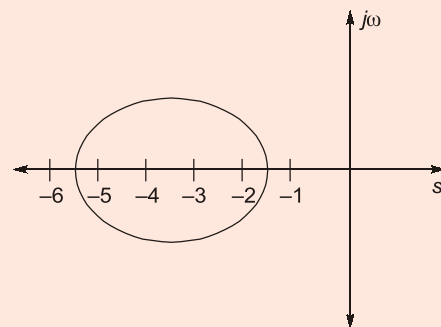
List-I (Time function)	List-II (Laplace transform)
A. 1	1. $\frac{1}{s}$
B. t	2. $\frac{1}{s^2}$
C. sin ωt	3. $\frac{s}{(s^2 + \omega^2)}$
D. cos ωt	4. $\frac{\omega}{(s^2 + \omega^2)}$

Codes :

	A	B	C	D
(a)	2	1	4	3
(b)	1	2	3	4
(c)	1	2	4	3
(d)	2	1	3	4

Ans. (c)

Q.82 Transfer function for a unity-feedback system having root locus shown below in figure :



- (a) $\frac{A(s+2)}{(s+1)(s+5)}$ (b) $\frac{A(s+5)}{(s+1)(s+2)}$
 (c) $\frac{A(s+1)}{(s+5)(s+6)}$ (d) $\frac{A}{s(s+1)(s+5)}$

Ans. (b)

- Q.83** The unique model of a system is
 (a) Transfer function (b) Signal flow graphs
 (c) State variables (d) Block diagrams

Ans. (a)

- Q.84** Calculate the sag for a span of 200 m if the ultimate tensile strength of conductor is 6000 kgf. Allow a factor of safety of 2.
 (a) 2.5 m (b) 1.0 m
 (c) 2.0 m (d) 1.5 m

Ans. (d)

- Q.85** A unity feedback system has a forward path transfer function $G(s) = \frac{10(1+4s)}{s^2(1+s)}$. If the system is subjected to an input $r(t) = 1+t+\frac{t^2}{2}$, the steady state error of the system will be
 (a) ∞ (b) zero
 (c) 10 (d) 0.1

Ans. (d)

- Q.86** A field F is said to be conservative if
 (a) $\nabla \cdot \bar{F} = 0$ (b) $\nabla \times \bar{F} = 0$
 (c) $\nabla \cdot \nabla \bar{F} = 0$ (d) None of the above

Ans. (b)

- Q.87** If the excitation of a 3-phase alternator, operating on infinite bus bars, is changed, which one of the following shall alter?
 (a) Frequency of machine
 (b) Active power of machine
 (c) Terminal voltage of machine
 (d) Reactive power of machine

Ans. (d)

- Q.88** An op-amp has a common mode gain of 0.01 and a differential gain of 10^5 . Its CMRR would be
 (a) 10^7 (b) 10^{-7}
 (c) 10^3 (d) 10^{-3}

Ans. (a)

- Q.89** The impedance of a parallel RLC network is $Z(s) = \frac{5s}{s^2 + 0.5s + 100}$, the value of R , L and C are respectively

- (a) $2 \Omega, \frac{1}{20} \text{H}, \frac{1}{5} \text{F}$ (b) $10 \Omega, \frac{1}{20} \text{H}, \frac{1}{5} \text{F}$
 (c) $10 \Omega, \frac{1}{20} \text{H}, \frac{1}{2} \text{F}$ (d) $1 \Omega, \frac{1}{2} \text{H}, \frac{1}{5} \text{F}$

Ans. (b)

- Q.90** A pair of high frequency parallel transmission lines has distributed capacitance and inductance of $1 \mu\text{F}$ and 10mH respectively. Characteristic impedance of the line is
 (a) 100Ω (b) 98.26Ω
 (c) 110Ω (d) 125Ω

Ans. (a)

- Q.91** Natural frequency of oscillation for a second order system is 10 rad/sec and its damping ratio is 0.1 . The 2% settling time is
 (a) 4.5 sec (b) 4.0 sec
 (c) 0.4 sec (d) 10 sec

Ans. (b)

- Q.92** Two 550 kVA alternators operates in parallel to supply following loads :
 (i) 250 kW at 0.95 p.f. lagging
 (ii) 100 kW at 0.85 p.f. leading
 If one machine is supplying 200 kW at 0.9 p.f. lagging, then p.f. of other machine will be
 (a) 0.89 lagging (b) 0.89 leading
 (c) 0.95 lagging (d) 0.95 leading

Ans. (b)

Q.93 The root locus of the open loop transfer function

$$G(s)H(s) = \frac{k(s+3)}{s(s+2)}$$

- (a) Hyperbola (b) Circle
(c) Ellipse (d) Parabola

Ans. (b)

Q.94 If $E = 0$ at all points on a closed surface, then correct statements are

1. The electric flux through all points of the surface is zero.
 2. The total charge enclosed by the surface is zero.
 3. Charge resides on the surface.
- (a) 1, 2 and 3 (b) 1 and 2 only
(c) 2 and 3 only (d) 1 and 3 only

Ans. (b)

Q.95 Corona is

- (a) Unequal distribution of currents
(b) Partial breakdown of air
(c) Sparking between lines
(d) Complete breakdown of air

Ans. (d)

Q.96 The negative feedback in an amplifier leads to

- (a) Decrease in band width
(b) Increase in current gain
(c) Increase in voltage gain
(d) Decrease in voltage gain

Ans. (d)

Q.97 Consider the system represented in state variable form

$$\dot{x} = Ax + Bu$$

$$y = Cx + Du$$

where $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -k & -k & -k \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $C =$

- $\begin{bmatrix} 1 & 0 & 0 \end{bmatrix}$, $D = [0]$. The values of k for a stable system are
- (a) All values of k (b) $k < 1$
(c) $k > 1$ (d) $k = 1$

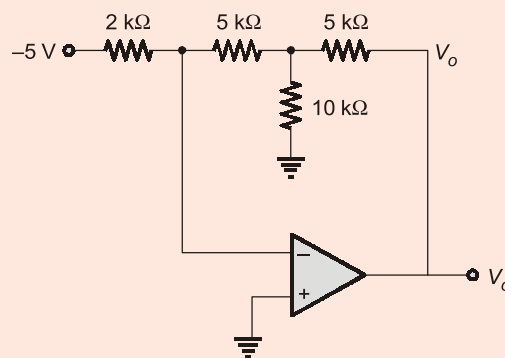
Ans. (c)

Q.98 A wave guide can be considered to be analogous to a

- (a) band stop filter
(b) low pass filter
(c) band pass filter
(d) high pass filter

Ans. (d)

Q.99 Output voltage of the circuit given below is



- (a) 35 V (b) 40.5 V
(c) 42.5 V (d) 12.5 V

Ans. (c)

Q.100 An industrial consumer has a daily load pattern of 2000 kW, 0.8 lagging power factor for 12 hours and 1000 kW at UPF for 12 hours. The load factor is

- (a) 1.00 (b) 0.65
(c) 0.75 (d) 0.875

Ans. (c)

Q.101 The unit step response of a system is $[1 - e^{-1(1+t)}]U(t)$. The system is

- (a) Oscillatory (b) Unstable
(c) Critically stable (d) Stable

Ans. (c)

Q.102 An 8-pole, 3-phase, 50 Hz induction motor is operating at 720 rpm. The frequency of rotor current is

- (a) 1 Hz (b) 2 Hz
(c) 3 Hz (d) 4 Hz

Ans. (b)

Q.103 For an electric field $E = E_0 \sin \omega t$. The phase difference between the conduction current and displacement current is

- (a) 180° (b) 45°
(c) 90° (d) 0°

Ans. (c)

Q.104 A two-port device is defined by the following pair of equations :

$$i_1 = 2v_1 + v_2 \text{ and } i_2 = v_1 + v_2$$

Its impedance parameters (Z_{11} , Z_{12} , Z_{21} , Z_{22}) are

- (a) (2, -1, -1, 1) (b) (2, 1, 1, 1)
(c) (1, 1, 1, 2) (d) (1, -1, -1, 2)

Ans. (d)

Q.105 Reactance relay is normally preferred for protection against

- (a) Phase fault
(b) Earth fault
(c) Open circuit fault
(d) None of these

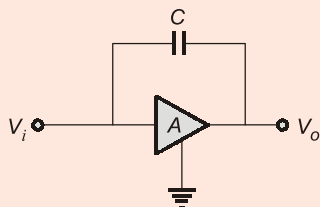
Ans. (b)

Q.106 Electromagnetic wave travelling in high loss medium at frequency f_1 has attained wavelength λ_1 when frequency become 4 times, corresponding wavelength will be

- (a) $4\lambda_1$ (b) $\frac{\lambda_1}{4}$
(c) $2\lambda_1$ (d) $\frac{\lambda_1}{2}$

Ans. (b)

Q.107 An amplifier of gain 'A' is bridged by capacitance C as shown in below circuit, then the effective input capacitance is



- (a) $C(1 - A)$ (b) C/A
(c) $C(1 + A)$ (d) AC

Ans. (c)

Q.108 For an N-channel JFET $I_{DSS} = 12 \text{ mA}$, $V_o = -7 \text{ V}$, $V_{OS} = -3.5 \text{ V}$. The value of I_D is

- (a) 18 mA (b) 2 mA
(c) 3 mA (d) 6 mA

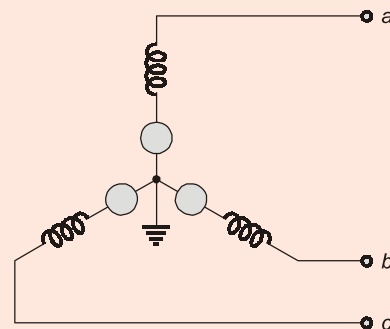
Ans. (c)

Q.109 A system has a characteristic equation $s^3 + 2s^2 + (K + 1)s + 6 = 0$. The range of K for a stable system will be

- (a) $K < 2$ (b) $1 < K < 2$
(c) $0.5 < K < 1.5$ (d) $K > 2$

Ans. (d)

Q.110 If the fault takes place between phase b and phase c, choose the incorrect statement for boundary condition for given figure :



- (a) $I_D = \sqrt{3}I_C$ (b) $I_s = 0$
(c) $V_b = V_c$ (d) $I_b + I_c = 0$

Ans. (a)

Q.111 Given a badly underdamped control system, the type of cascade compensator to be used to improve its damping is

- (a) notch filter (b) phase-lead
(c) phase-lead-lag (d) phase-lag

Ans. (b)

Q.112 Transformer rating is given in kVA because total loss of the transformer depends on

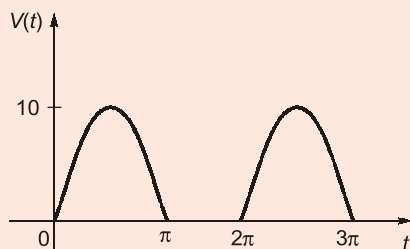
- (a) Current only
(b) Voltage only
(c) Phase angle between voltage and current
(d) Both (a) and (b)

Ans. (d)

Q.113 Bulk power transmission over a long HVDC lines are preferred on account of
 (a) No Harmonic problems
 (b) Low cost of HVDC terminal
 (c) Minimum line power losses
 (d) Simple protection

Ans. (b)

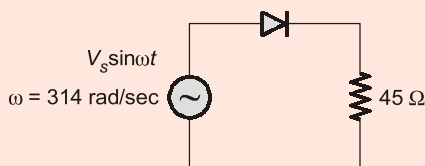
Q.114 The waveform shown below is a halfwave rectified sine wave. The average power dissipated in a $10\ \Omega$ resistor is



- (a) 2.5 W (b) 25 W
 (c) 0.25 W (d) 250 W

Ans. (a)

Q.115 The forward resistance of the diode shown in circuit below is $5\ \Omega$ and the other parameters are same as those of an ideal diode. What is dc component of source current?



- (a) $\frac{2V_m}{50\pi}$ (b) $\frac{V_m}{50\pi\sqrt{2}}$
 (c) $\frac{V_m}{50\pi}$ (d) $\frac{V_m}{100\pi\sqrt{2}}$

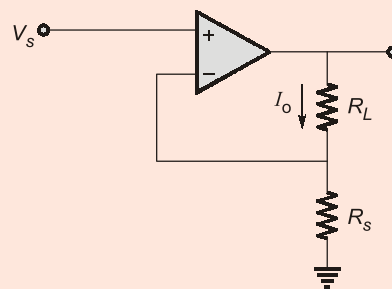
Ans. (c)

Q.116 In free space, if $\rho = 0$, the Poisson's equation becomes

- (a) Laplacian equation $\nabla^2 V = 0$.
 (b) Maxwell's convergence equation $\nabla \cdot \vec{B} = 0$.
 (c) Kirchhoff's voltage equation $\sum V = 0$.
 (d) None of the above

Ans. (a)

Q.117 An op-amp based circuit is shown in figure below. Current I_0 is



- (a) $V_s \left(\frac{1}{R_s} + \frac{1}{R_L} \right)$ (b) $V_s \times \frac{R_L}{R_s(R_L + R_s)}$
 (c) $\frac{V_s}{R_s}$ (d) $\frac{V_s}{R_L}$

Ans. (c)

Q.118 The system $\dot{X} = AX + BU$ with $A = \begin{bmatrix} -1 & 2 \\ 0 & 2 \end{bmatrix}$,

$B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ is

- (a) Stable but uncontrollable
 (b) Stable and controllable
 (c) Unstable and uncontrollable
 (d) Unstable but controllable

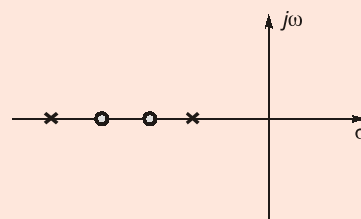
Ans. (d)

Q.119 IGBT and BJT both possess

- (a) High Input Impedance
 (b) Low on-state power losses
 (c) Low switching losses
 (d) High on-state power losses

Ans. (d)

Q.120 The pole-zero shown below represents a



- (a) Lag-lead compensating network
 (b) PID controller
 (c) PD controller
 (d) None of the above

Ans. (a)

Q.121 Which of the following points locate the quiescent points?

- (a) (I_C, V_{CE}) (b) (I_C, V_{CB})
(c) (I_E, V_{CB}) (d) (I_E, V_{CE})

Ans. (a)

Q.122 A Hartley oscillator is used for generating

- (a) Audio frequency oscillations
(b) Very low frequency oscillations
(c) Microwave oscillations
(d) Radio frequency oscillations

Ans. (d)

Q.123 A generating station has a maximum demand of 30 MW, its load factor is 60% and plant capacity factor is 50%. The reserve capacity of the plant is

- (a) 6 MW (b) 10 MW
(c) 5 MW (d) 4 MW

Ans. (a)

Q.124 The rated voltage of 3-phase power system is given as

- (a) peak line to line voltage
(b) rms phase voltage
(c) rms line to line voltage
(d) peak phase voltage

Ans. (c)

Q.125 A 10 kVA, 400 V/200 V single-phase transformer with 10% impedance draws a steady short circuit current of

- (a) 350 A (b) 50 A
(c) 250 A (d) 150 A

Ans. (c)

