

पुस्तिका में पृष्ठों की संख्या : 16
Number of Pages in Booklet : 16
पुस्तिका में प्रश्नों की संख्या : 100
No. of Questions in Booklet : 100

NEAP-25

इस प्रश्न-पुस्तिका को तब तक न खोलें जब तक कहा न जाए। Do not open this Question Booklet until you are asked to do so.



395609

Paper Code : 36

Sub : Electrical Engineering

प्रश्न-पुस्तिका संख्या व बारकोड /

Question Booklet No. & Barcode

समय : 02:00 घण्टे + 10 मिनट अतिरिक्त*

अधिकतम अंक : 200

Time : 02:00 Hours + 10 Minutes Extra*

Maximum Marks : 200

प्रश्न-पुस्तिका के पेपर की सील/पोलिथीन बैग को खोलने पर प्रश्न-पत्र हल करने से पूर्व परीक्षार्थी यह सुनिश्चित कर लें कि :

- प्रश्न-पुस्तिका संख्या तथा ओ.एम.आर. उत्तर-पत्रक पर अंकित बारकोड संख्या समान हैं।
- प्रश्न-पुस्तिका एवं ओ.एम.आर. उत्तर-पत्रक के सभी पृष्ठ व सभी प्रश्न सही मुद्रित हैं। समस्त प्रश्न, जैसा कि ऊपर वर्णित है, उपलब्ध हैं तथा कोई भी पृष्ठ कम नहीं है/ मुद्रण त्रुटि नहीं है। किसी भी प्रकार की विसंगति या दोषपूर्ण होने पर परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें। यह सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी। परीक्षा प्रारम्भ होने के 5 मिनट पश्चात् ऐसे किसी दावे/आपत्ति पर कोई विचार नहीं किया जायेगा।

On opening the paper seal/polythene bag of the Question Booklet before attempting the question paper, the candidate should ensure that :

- Question Booklet Number and Barcode Number of OMR Answer Sheet are same.
- All pages & Questions of Question Booklet and OMR Answer Sheet are properly printed. All questions as mentioned above are available and no page is missing/misprinted.

If there is any discrepancy/defect, candidate must obtain another Question Booklet from Invigilator. Candidate himself shall be responsible for ensuring this. No claim/objection in this regard will be entertained after five minutes of start of examination.

परीक्षार्थियों के लिए निर्देश

1. प्रत्येक प्रश्न के लिये एक विकल्प भरना अनिवार्य है।
2. सभी प्रश्नों के अंक समान हैं।
3. प्रत्येक प्रश्न का मात्र एक ही उत्तर दीजिए। एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा।
4. OMR उत्तर-पत्रक इस प्रश्न-पुस्तिका के अन्दर रखा है। जब आपको प्रश्न-पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल नीले बॉल पॉइंट पेन से विवरण भरें।
5. कृपया अपना रोल नम्बर ओ.एम.आर. उत्तर-पत्रक पर सावधानीपूर्वक सही भरें। गलत रोल नम्बर भरने पर परीक्षार्थी स्वयं उत्तरदायी होगा।
6. ओ.एम.आर. उत्तर-पत्रक में करेक्शन पेन/व्हाइटनर/सफेदा का उपयोग निषिद्ध है।
7. प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा। गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है।
8. प्रत्येक प्रश्न के पाँच विकल्प दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4, 5 अंकित किया गया है। अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले (बबल) को उत्तर-पत्रक पर नीले बॉल पॉइंट पेन से गहरा करना है।
9. यदि आप प्रश्न का उत्तर नहीं देना चाहते हैं तो उत्तर-पत्रक में पाँचवें (5) विकल्प को गहरा करें। यदि पाँच में से कोई भी गोला गहरा नहीं किया जाता है, तो ऐसे प्रश्न के लिये प्रश्न अंक का 1/3 भाग काटा जायेगा।
- 10.* प्रश्न-पत्र हल करने के उपरांत अभ्यर्थी अनिवार्य रूप से ओ.एम.आर. उत्तर-पत्रक जाँच लें कि समस्त प्रश्नों के लिये एक विकल्प (गोला) भर दिया गया है। इसके लिये ही निर्धारित समय से 10 मिनट का अतिरिक्त समय दिया गया है।
11. यदि अभ्यर्थी 10% से अधिक प्रश्नों में पाँच विकल्पों में से कोई भी विकल्प अंकित नहीं करता है तो उसको अयोग्य माना जायेगा।
12. मोबाइल फोन अथवा अन्य किसी इलेक्ट्रॉनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है। यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी।

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए राजस्थान सार्वजनिक परीक्षा (भर्ती) में अनुचित साधनों की रोकथाम अधिनियम, 2022 तथा अन्य प्रभावी कानून एवं आयोग के नियमों-प्रावधानों के तहत कार्यवाही की जाएगी। साथ ही आयोग ऐसे अभ्यर्थी को भविष्य में होने वाली आयोग की समस्त परीक्षाओं से विवर्जित कर सकता है।

INSTRUCTIONS FOR CANDIDATES

1. It is mandatory to fill one option for each question.
2. All questions carry equal marks.
3. Only one answer is to be given for each question. If more than one answers are marked, it would be treated as wrong answer.
4. The OMR Answer Sheet is inside this Question Booklet. When you are directed to open the Question Booklet, take out the Answer Sheet and fill in the particulars carefully with Blue Ball Point Pen only.
5. Please correctly fill your Roll Number in OMR Answer Sheet. Candidates will themselves be responsible for filling wrong Roll No.
6. Use of Correction Pen/Whitener in the OMR Answer Sheet is strictly forbidden.
7. 1/3 part of the mark(s) of each question will be deducted for each wrong answer. A wrong answer means an incorrect answer or more than one answers for any question.
8. Each question has five options marked as 1, 2, 3, 4, 5. You have to darken only one circle (bubble) indicating the correct answer on the Answer Sheet using BLUE BALL POINT PEN.
9. If you are not attempting a question then you have to darken the circle '5'. If none of the five circles is darkened, one third (1/3) part of the marks of question shall be deducted.
- 10.* After solving question paper, candidate must ascertain that he/she has darkened one of the circles (bubbles) for each of the questions. Extra time of 10 minutes beyond scheduled time, is provided for this.
11. A candidate who has not darkened any of the five circles in more than 10% questions shall be disqualified.
12. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt with as per rules.

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would be liable to be prosecuted under Rajasthan Public Examination (Measures for Prevention of Unfair means in Recruitment) Act, 2022 & any other laws applicable and Commission's Rules-Regulations. Commission may also debar him/her permanently from all future examinations.

उत्तर-पत्रक में दो प्रतियाँ हैं - मूल प्रति और कार्बन प्रति। परीक्षा समाप्ति पर परीक्षा कक्ष छोड़ने से पूर्व परीक्षार्थी उत्तर-पत्रक की दोनों प्रतियाँ वीक्षक को सौंपेंगे, परीक्षार्थी स्वयं कार्बन प्रति अलग नहीं करें। वीक्षक उत्तर-पत्रक की मूल प्रति को अपने पास जमा कर, कार्बन प्रति को मूल प्रति से कट लाइन से मोड़ कर सावधानीपूर्वक अलग कर परीक्षार्थी को सौंपेंगे, जिसे परीक्षार्थी अपने साथ ले जायेंगे। परीक्षार्थी को उत्तर-पत्रक की कार्बन प्रति चयन प्रक्रिया पूर्ण होने तक सुरक्षित रखनी होगी एवं आयोग द्वारा माँगे जाने पर प्रस्तुत करनी होगी।



1. Unit of the permittivity of free space ϵ_0 is
 - (1) Farad/meter²
 - (2) Coulomb²/(Newton.meter²)
 - (3) Coulomb²/(Newton.meter)
 - (4) ϵ_0 is a dimensionless constant
 - (5) Question not attempted
2. Stoke's theorem relates
 - (1) Volume integral to a closed surface integral
 - (2) Volume integral to a closed line integral
 - (3) Closed surface integral to a closed line integral
 - (4) Surface integral to a closed line integral
 - (5) Question not attempted
3. The equivalent coordinate of $\vec{A} = 2\hat{a}_x - 2\hat{a}_y + 3\hat{a}_z$ in cylindrical coordinate system is
 - (1) $\left(\sqrt{17}, \frac{3\pi}{4}, 3\right)$ (2) $\left(\sqrt{17}, \frac{\pi}{4}, 3\right)$
 - (3) $\left(\sqrt{8}, \frac{\pi}{4}, 3\right)$ (4) $\left(\sqrt{8}, \frac{3\pi}{4}, 3\right)$
 - (5) Question not attempted
4. Displacement current in a dielectric material is
 - (1) The current due to movement of free electrons in the material
 - (2) The current due to a steady electric field
 - (3) The current due to time-varying magnetic flux density
 - (4) The current due to time-varying electric flux density
 - (5) Question not attempted
5. The work done in carrying a charge through an equipotential surface :
 - (1) is zero
 - (2) depends on the charge Q
 - (3) is infinity
 - (4) depends on the distance
 - (5) Question not attempted
6. In ferrimagnetic materials, the neighbouring spin lattices are
 - (1) Antiparallel but of unequal magnitude
 - (2) Parallel but of equal magnitude
 - (3) Antiparallel but of equal magnitude
 - (4) Parallel but of unequal magnitude
 - (5) Question not attempted
7. Which of the following is correct for relationship between carrier density (n) and Temperature (T) magnetic material, if x is a rational number ?
 - (1) $n \propto T^x$ (2) $n \propto \frac{1}{T^x}$
 - (3) $n \propto \frac{T}{x}$ (4) $n \propto T \cdot (x)$
 - (5) Question not attempted
8. Which of the following is NOT a type of polarization in dielectrics ?
 - (1) Orientational polarization
 - (2) Meissner polarization
 - (3) Electronic polarization
 - (4) Ionic polarization
 - (5) Question not attempted
9. The correct statement for the Ferromagnetic material is :
 - (1) Atoms have no magnetic moment
 - (2) Atoms have randomly oriented magnetic moments
 - (3) Atoms have parallel aligned magnetic moments
 - (4) Atoms have mixed parallel and anti parallel aligned magnetic moments
 - (5) Question not attempted





10. Which of the following is correct for susceptibility of Diamagnetism ?

- (1) Small & negative
- (2) Small & positive
- (3) Large & positive
- (4) Large & negative
- (5) Question not attempted

11. We have various bridge and the parameters to be measured by a particular bridge. Match List-1 (Bridge) with List-2 (Parameter to be measured) and select the correct answer :

List-1		List-2	
I. Maxwell's Bridge	A. Frequency		
II. Hay's Bridge	B. Inductance of medium Q Coils ($1 < Q < 10$)		
III. Schering Bridge	C. Inductance of high Q Coils ($Q > 10$)		
IV. Wein's Bridge	D. Capacitance		

	I	II	III	IV
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(1)	D	C	B	A
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(2)	D	A	B	C
-----	---	---	---	---

(3)	B	A	D	C
-----	---	---	---	---

(4)	B	C	D	A
-----	---	---	---	---

(5)	Question not attempted			
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12. Wattmeter are compensated for errors caused by inductance of pressure coil by

- (1) Connecting capacitor in series with multiplier
- (2) Connecting capacitor in parallel with multiplier
- (3) Connecting resistor in parallel with multiplier
- (4) Connecting resistor and inductor in series with multiplier
- (5) Question not attempted

13. A resistance is rated at 3200 ohm and the current flowing through this is 64 mA. It was later found that the resistance of resistor was 0.2 percent greater than specified resistance and the ammeter read 0.75 percent more than true current. The relative error in power is equal to

- (1) 1.3 percent more
- (2) 1.5 percent more
- (3) 1.5 percent less
- (4) 1.7 percent more
- (5) Question not attempted

14. In a saturable core frequency meter, the output current is measured by

- (1) Moving iron ammeter
- (2) Permanent magnet moving coil ammeter
- (3) Electrodynamometric ammeter
- (4) Hot wire ammeter
- (5) Question not attempted

15. A moving coil ammeter having a resistance of 1.5 ohm gives full scale deflection when a current of 15 mA is passed through it. The instrument can be used for the measurement of voltage upto 15 Volt by

- (1) Connecting a resistance of 998.5 ohm in series with the ammeter
- (2) Connecting a resistance of 1000 ohm parallel to the ammeter
- (3) Connecting a resistance of 1000 ohm parallel to the load
- (4) Connecting a resistance of 1000 ohm in series with the load
- (5) Question not attempted



16. Thermistors used for measurement are essentially

- (1) A pure resistance with positive temperature coefficient
- (2) Semiconductor devices with high negative temperature coefficient
- (3) Semiconductor devices with low negative temperature coefficient
- (4) A pure resistance with negative temperature coefficient
- (5) Question not attempted

17. Match the transducers in List-A with their type in List-B.

List-A			List-B		
I.	LVDT		A.	Resistive	
II.	Strain gauge		B.	Inductive	
III.	Smartphone touch screen		C.	Capacitive	

I II III

(1) A B C

(2) B A C

(3) A C B

(4) C A B

(5) Question not attempted

18. The output of LVDT is 3 V at maximum displacement. At a load of 1 MΩ, the deviation from linearity is maximum and it is ± 0.003 V from a straight line through origin. The linearity at the given load is

- (1) $\pm 0.1\%$
- (2) $\pm 0.2\%$
- (3) $\pm 0.04\%$
- (4) $\pm 1.0\%$
- (5) Question not attempted

19. Which of the following is a passive transducer ?

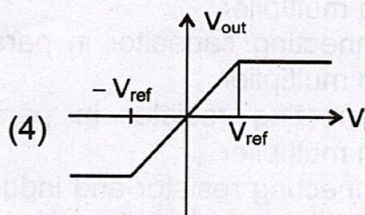
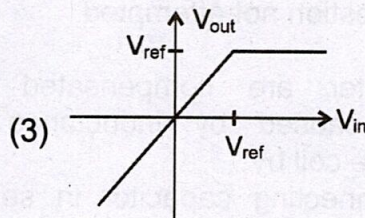
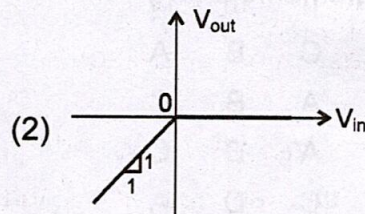
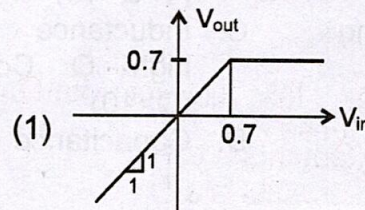
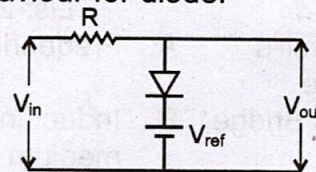
- (1) Thermocouple
- (2) LVDT
- (3) Photovoltaic Cell
- (4) Piezoelectric pickup
- (5) Question not attempted

20. Piezoelectric accelerometer converts _____ energy to _____ energy.

- (1) mechanical, electrical and vice-versa
- (2) electrical, chemical and vice-versa
- (3) mechanical, sound and vice-versa
- (4) electrical, sound and vice-versa
- (5) Question not attempted



21. For the diode circuit shown, which is the correct voltage transfer characteristic drawn between V_{out} versus V_{in} . Assume ideal diode behaviour for diode.



(5) Question not attempted



22. In a system with x_1 and x_2 as input and output quantities respectively, the gain x_2/x_1 is required to be expressed in deciBel (dB). Following 4 statements were presented for the same :

A. $10 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are voltages in Volt.

B. $20 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_2, x_1 are currents in Ampere.

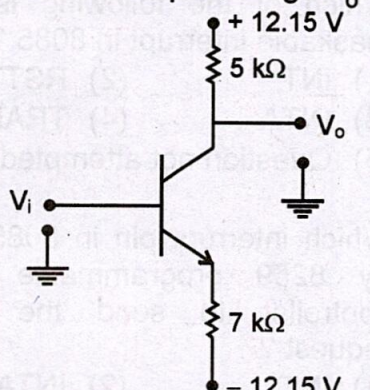
C. $20 \ln \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are either voltages or currents.

D. $10 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are powers in W.

Which of the following options identifies the correct statements among these ?

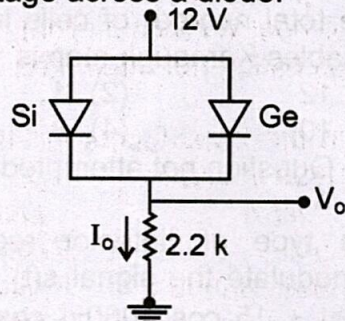
- (1) Statements A & B
- (2) Statements B & D
- (3) Statements A & C
- (4) Statements D & C
- (5) Question not attempted

23. The NPN transistor is shown in figure with $\alpha = 1$, $V_{BEON} = 0.7$ V, and $V_{CEsat} = 0.3$ V. If the transistor is in saturation, then find the output voltage V_o .



- (1) 2.15 V
- (2) 1.85 V
- (3) 2.50 V
- (4) 2.00 V
- (5) Question not attempted

24. Both the diodes used in given circuit behave as a short circuit when $V_D > V_\gamma$ and as an open circuit when $V_D < V_\gamma$, where V_γ is the cut-in voltage of the diode. If Silicon diode has V_γ as 0.7 V and Germanium diode has V_γ as 0.3 V, the current I_o would be _____ mA. V_D is the voltage across a diode.



- (1) 5.14
- (2) 5.32
- (3) 5.45
- (4) 0 V
- (5) Question not attempted

25. Assertion (A) : P-channel MOSFETs allow faster switching speeds as compared to N-channel MOSFETs.

Reason (R) : Mobility of electrons is greater than that of holes.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true.
- (5) Question not attempted

26. The Bodean expression $AB + AC$ is equivalent to _____.

- (1) $AB + AC + BC$
- (2) $AB'C' + ABC' + A'BC$
- (3) $ABC + A'BC + B'C'$
- (4) $ABC + ABC' + AB'C$
- (5) Question not attempted



27. Which one of the following has small power dissipation and high noise immunity ?

- (1) Transistor Transistor Logic (TTL)
- (2) CMOS
- (3) Emitter Coupled Logic (ECL)
- (4) NMOS
- (5) Question not attempted

28. The total number of cells in a three variables Karnaugh map is :

- (1) 12
- (2) 4
- (3) 10
- (4) 8
- (5) Question not attempted

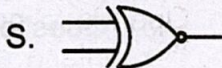
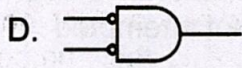
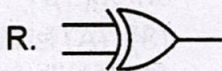
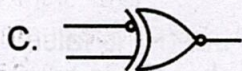
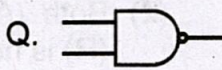
29. The type of detector required to demodulate the signal $s(t) = 10 \cos 10^5 \pi t + 15 \cos 1000 \pi t \cos 10^5 \pi t$ is

- (1) Envelope detector
- (2) Coherent detector
- (3) Rate detector
- (4) PLL
- (5) Question not attempted

30. Match the logic gates in Column-I with their equivalents in Column-II.

Column-I

Column-II



- | | | | | |
|-----|------------------------|---|---|---|
| | A | B | C | D |
| (1) | R | Q | S | P |
| (2) | R | P | Q | S |
| (3) | S | Q | R | P |
| (4) | P | R | S | Q |
| (5) | Question not attempted | | | |

31. Intel 8085 microprocessor has

- (1) 8 bit data bus and 8 bit address bus
- (2) 16 bit data bus and 8 bit address bus
- (3) 8 bit data bus and 16 bit address bus
- (4) 16 bit data bus and 16 bit address bus
- (5) Question not attempted

32. HOLD pin in 8085 microprocessor is used as a handshake signal to interface with

- (1) Programmable interval timer chip
- (2) DMA controller chip
- (3) Programmable interrupt controller chip
- (4) Hard disk memory
- (5) Question not attempted

33. In 8085 microprocessor, during a subroutine CALL, the return address is saved

- (1) In the HL pair
- (2) In the stack
- (3) In the program counter
- (4) At the interrupt vector location
- (5) Question not attempted

34. Which of the following is a non-maskable interrupt in 8085 ?

- (1) INT
- (2) RST7.5
- (3) INTA
- (4) TRAP
- (5) Question not attempted

35. Which interrupt pin in 8085 is used by 8259 programmable interrupt controller to send the interrupt request ?

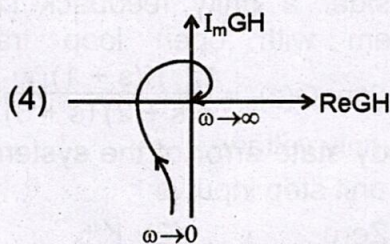
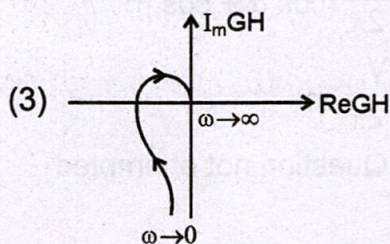
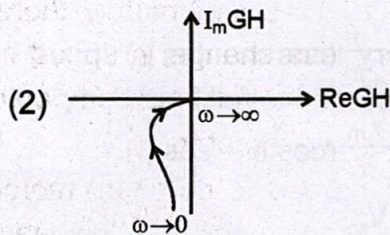
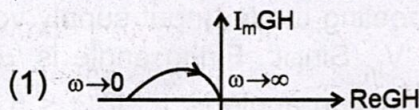
- (1) INT
- (2) INTA
- (3) RST7.5
- (4) TRAP
- (5) Question not attempted



36. In a PWM inverter, f_c and f are the frequencies for the carrier signal and reference signal, respectively. Then the number of pulses per half cycle is
- (1) $N = f/f_c$ (2) $N = f/2f_c$
(3) $N = f_c/2f$ (4) $N = f_c/f$
(5) Question not attempted
37. In a three-phase full wave a.c. to d.c. converter, the ratio of output ripple-frequency to the supply voltage frequency is
- (1) 2 (2) 3
(3) 6 (4) 12
(5) Question not attempted
38. In a power circuit of 3 kV, four thyristors each of rating 800 V are connected in series. The percentage series derating factor will be
- (1) 50 (2) 25
(3) 12.5 (4) 6.25
(5) Question not attempted
39. A step-up dc chopper has input voltage of 110 V and output voltage of 330 V. Turn-off time is 200 μ -sec, 'duty ratio' of the chopper is :
- (1) 1/3 (2) 2/3
(3) 1/2 (4) 1/9
(5) Question not attempted
40. A single phase half controlled rectifier feeds R-L load without free wheeling diode. Input supply voltage is ' $V_m \sin \omega t$ '. Firing angle is ' α ' and extinction angle is ' β '. If $(\pi < \beta < 2\pi)$ then average output voltage of the rectifier is :
- (1) $\frac{V_m}{2\pi} (\cos \alpha - \cos \beta)$
(2) $\frac{V_m}{\pi} (\cos \alpha - \cos \beta)$
(3) $\frac{V_m}{2\pi} (\cos \alpha + \cos \beta)$
(4) $\frac{V_m}{2\pi} \cos (\beta - \alpha)$
(5) Question not attempted
41. Consider a unity feedback control system with open loop transfer function $G(s) = \frac{K(s+1)}{s(s+2)(s+3)}$. The steady state error of the system due to a unit step input is
- (1) Zero (2) $K/6$
(3) $6/K$ (4) Infinite
(5) Question not attempted
42. The Nyquist stability criterion is written as $N = P - Z$ where N is the number of anti-clockwise encirclements of the critical point by the Nyquist plot, P is the number of Open-loop poles in the right half of the s-plane and Z is the number of _____ in the right half of s-plane.
- (1) Closed loop zeroes
(2) Open loop zeroes
(3) Closed loop poles
(4) Open loop poles
(5) Question not attempted



43. Which of the following is the polar plot of the transfer function $GH(s) = 2/s(s+2)$?



(5) Question not attempted

44. The open loop transfer function of a unity feedback system is given as $G(s) = K(s+2)/(s+1)(s+4)$. Which of the following statements is/are true for the root loci of the system ?

Statement A : Root loci on the real axis will lie between $(-1 \text{ \& } -2)$ and $(-4 \text{ \& } -\infty)$.

Statement B : Centroid of the asymptotes will be at $s = -3$ and the angle of the asymptotes will be $\pm 90^\circ$.

- (1) A is true, but B is false.
(2) A is false, but B is true.
(3) Both A and B are true.
(4) Both A and B are false.
(5) Question not attempted

45. A linear time invariant system initially at rest, when subjected to a unit step input, gives a response $y(t) = te^{-t}$, $t > 0$, the transfer function of the system is :

(1) $\frac{1}{(s+1)^2}$ (2) $\frac{1}{s(s+1)^2}$

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

(5) Question not attempted

46. The transfer function of a second order system is given as $5/(s^2 + 2s + 25)$.

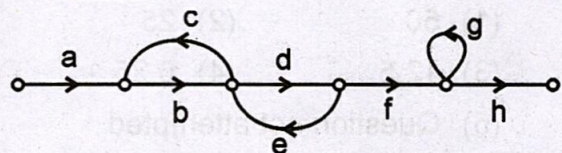
The peak time of the system is _____.

(1) $\frac{2\pi}{\sqrt{24}}$ (2) $\frac{\pi}{\sqrt{3/2}}$

(3) $\frac{\pi}{\sqrt{24}}$ (4) $\frac{\pi}{\sqrt{96}}$

(5) Question not attempted

47. The overall gain of a system having the signal flow graph shown below is _____.



(1) $abdfh/1 - bc - de - g + bcg + deg$

(2) $abdfh/1 - bc - de - g - bcg - deg$

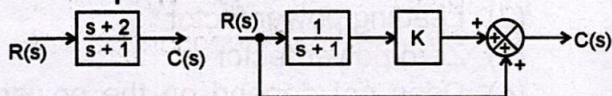
(3) $abdfh/1 + bc + de + g + bcg + deg$

(4) $abdfh/1 + bc + de + g - bcg - deg$

(5) Question not attempted



48. For what value of K , the two block diagrams as shown below are equivalent :



- (1) 1 (2) 2
(3) $(s+1)$ (4) $(s+2)$
(5) Question not attempted
49. The open loop transfer function of a unity feedback system is given by $G(s) = K(s+a)/(s^3 + 2s^2 + 2s + 1)$. What value of ' K ' and ' a ' will make the system marginally stable ?
- (1) $K = 5$ & $a = 1$
(2) $K = 1$ & $a = 1$
(3) $K = 5$ & $a = 5$
(4) $K = 1$ & $a = 5$
(5) Question not attempted
50. In Bode plot, if the low frequency asymptote is a horizontal line at x db, then the transfer function representing a type-0 system with a gain K is given by :
- (1) $20 \log K = x$
(2) $K = \frac{1}{10} \log x$
(3) $10 \log K = x$
(4) $100 \log K = x$
(5) Question not attempted
51. A DC motor with supply voltage 250 volts, having armature resistance = 0.5 ohm, total brush drop = 2 volt and back emf = 230 volts. Find the value of armature current.
- (1) 40 Amp (2) 36 Amp
(3) 360 Amp (4) 46 Amp
(5) Question not attempted

52. For dc motors, which statement is correct ?

- (1) In a dc shunt motor, there is very less change in speed from NO-Load to Full load compared to a dc series motor.
(2) In a dc series motor, there is very less change in speed from No-Load to full load compared to a dc shunt motor.
(3) Compared to dc shunt motor, a dc series motor has low starting torque.
(4) For 'LATHE' machine dc series motor is preferred.
(5) Question not attempted

53. In a dc motor maximum power is developed when :

- (1) Value of back emf is equal to supply voltage
(2) Value of back emf is half of supply voltage
(3) Value of back emf is $\frac{1}{4}$ of supply voltage.
(4) Value of back emf is $\frac{3}{4}$ of supply voltage.
(5) Question not attempted

54. A 100 : 5 transformer is used in conjunction with a 5-ampere ammeter. If the latter reads 3.5 A, then the line current will be :

- (1) 50 A (2) 60 A
(3) 70 A (4) 80 A
(5) Question not attempted



- 55.** A 12-pole, 3-phase alternator driven at a speed of 500 r.p.m. supplies power to an 8-pole, 3-phase induction motor. If the slip of the motor at full load is 3%, calculate the full load speed of motor.
- (1) 727.5 rpm (2) 701.5 rpm
(3) 750.1 rpm (4) 650.2 rpm
(5) Question not attempted
- 56.** A 100 kVA transformer operates on full load having iron loss 1000 W, and copper loss is 1000 W at unity power factor. Calculate the efficiency of transformer on half-full load.
- (1) 82.65% (2) 89.34%
(3) 81.36% (4) 97.56%
(5) Question not attempted
- 57.** A 440-V DC shunt motor has armature resistance of 0.8Ω and field resistance of 200Ω . Determine the Armature current when giving an output of 7.46 kW at 85 percent efficiency.
- (1) 15.25 A (2) 17.75 A
(3) 14.75 A (4) 20.25 A
(5) Question not attempted
- 58.** In 3-phase slip ring induction motor, if we increase the rotor resistance
- (1) The maximum torque will increase.
(2) Starting torque and maximum torque will increase.
(3) Starting torque will increase but the maximum torque will remain same.
(4) Starting torque will remain constant but the maximum torque will increase.
(5) Question not attempted
- 59.** In the transformer, voltage regulation will be maximum at
- (1) Lagging power factor
(2) Leading power factor
(3) Zero power factor
(4) Does not depend on the power factor
(5) Question not attempted
- 60.** Regarding V-Curve of an alternator, which statement is correct ?
- (1) V-Curve is drawn between induced emf and armature current.
(2) V-Curve is drawn between induced emf and field current.
(3) V-Curve is drawn between speed and mechanical input torque to alternator.
(4) V-Curve is drawn between armature current and field current.
(5) Question not attempted
- 61.** A synchronous condenser means :
- (1) An under excited synchronous motor
(2) An over excited synchronous motor
(3) An over excited d.c. motor
(4) An under excited d.c. motor
(5) Question not attempted
- 62.** A three-phase 440 V, 6 pole, 50 Hz, squirrel cage induction motor is running at a slip of 5%. The speed of stator magnetic field with respect to rotor magnetic field and speed of rotor with respect to stator magnetic fields are
- (1) Zero, 100 rpm
(2) 1000 rpm, 950 rpm
(3) Zero, 50 rpm
(4) 1000 rpm, 50 rpm
(5) Question not attempted



63. A 3-phase induction motor is operating at full load slip 's'. If fifth harmonic is existing then slip of rotor with respect to fifth harmonic field is :
(1) 5s (2) s/5
(3) 6 + 5s (4) 6 - 5s
(5) Question not attempted
64. While running, a synchronous motor is compelled to run at synchronous speed because of
(1) damper winding in its pole faces
(2) magnetic locking between stator and rotor poles
(3) induced e.m.f. in rotor field winding by stator flux
(4) compulsion due to Lenz's law
(5) Question not attempted
65. Zero power factor method of an alternator is used to find its
(1) Efficiency
(2) Voltage Regulation
(3) Armature Resistance
(4) Synchronous Speed
(5) Question not attempted
66. The oscillation of the rotor about its equilibrium position in synchronous machine is called
(1) Synchronization
(2) Cogging
(3) Hunting
(4) Crawling
(5) Question not attempted
67. An induction motor when started on load, does not accelerate up to full speed but runs at $1/7^{\text{th}}$ of the rated speed. This tendency of motor is known as :
(1) Locking (2) Plugging
(3) Crawling (4) Cogging
(5) Question not attempted
68. Which one of the following is not true in the case of 3-phase induction motor ?
(1) It has robust and rugged construction.
(2) It requires minimum of maintenance.
(3) It need extra starting motor.
(4) It's speed decreases with increase in load.
(5) Question not attempted
69. Three loads are connected in parallel across a 1400 V rms, 60 Hz, Single phase supply :
Load 1 : Inductive load, 35 kW and 120 KVAR
Load 2 : Capacitive load, 10 kW and 40 KVAR
Load 3 : Resistive load of 15 kW
Total active and reactive loads are
(1) 80 kW, 60 KVAR
(2) 100 kW, 80 KVAR
(3) 60 kW, 100 KVAR
(4) 60 kW, 80 KVAR
(5) Question not attempted
70. A single-phase 50 Hz generator supplies an inductive load of 5000 kW at a p.f. of 0.707 (lagging) by means of a 20 km long transmission line. The line resistance and inductance are 0.0195 ohm and 0.63 mH per km. The voltage at receiving end is required to be kept constant at 10 kV. The sending end voltage of the line is equal to :
(1) 09.63 kV (2) 31.27 kV
(3) 22.19 kV (4) 12.17 kV
(5) Question not attempted



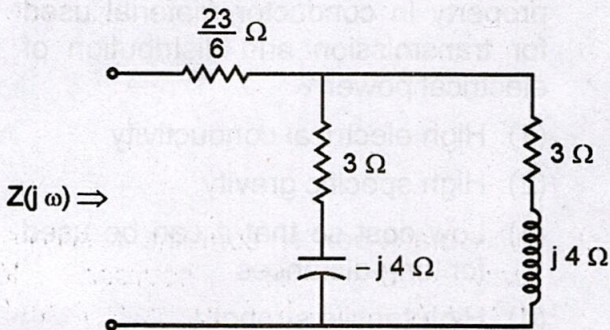
71. A 500 MVA, 22 kV, 60 Hz, four pole turbo-generator has an inertia constant, $H = 7.5$ MJ/MVA. If the mechanical power input is 552 MW and the electrical power output is 400 MW, with stator copper losses assumed to be negligible, determine the angular acceleration of the rotor.
- (1) 437.8 elec-degree/sec²
(2) 337.8 elec-degree/sec²
(3) 537.8 elec-degree/sec²
(4) 837.8 elec-degree/sec²
(5) Question not attempted
72. It is found that the receiving end voltage of a long transmission line is greater than sending end voltage on no load. This might happen due to which of the transmission line parameters ?
- (1) Capacitance (2) Inductance
(3) Resistance (4) Conductance
(5) Question not attempted
73. In a system of 132 kV, the line to ground capacitance is $0.01 \mu\text{F}$ and the inductance is 5 Henries. Determine the voltage appearing across the pole of a circuit breaker if a magnetising current of 5 amps is interrupted.
- (1) 210.5 kV (2) 111.8 kV
(3) 165.5 kV (4) 255.5 kV
(5) Question not attempted
74. A circuit breaker is rated at 1200 amps, 1500 MVA, 33 kV, 3-sec, 3-phase oil circuit breaker. The rated symmetrical breaking current will be :
- (1) 67 kA (2) 26.25 kA
(3) 24.25 kA (4) 37 kA
(5) Question not attempted
75. Corona loss increases with
- (1) increase frequency and increase diameter of conductor
(2) decrease frequency and decrease diameter of conductor
(3) decrease frequency and increase diameter of conductor
(4) increase frequency and decrease diameter of conductor
(5) Question not attempted
76. Consider the following statements regarding the addition of lumped capacitances in parallel to a lossless transmission line :
- a. It increases the characteristic impedance.
b. It increases the propagation constant.
c. It enhances system stability
d. It increases the charging current.
- Which of the above statements are correct ?
- (1) a and c (2) b, c and d
(3) a, b and d (4) b and d
(5) Question not attempted
77. The resultant transient voltage which appears across the breaker contacts at the instant of arc extinction is called
- (1) System voltage
(2) Recovery voltage
(3) Arc voltage
(4) Restriking voltage
(5) Question not attempted
78. The surge impedance of a 100 kilometre long underground cable is 50 "ohms". The surge impedance of a 40 kilometre long similar cable would be :
- (1) 20 ohms (2) 50 ohms
(3) 80 ohms (4) 125 ohms
(5) Question not attempted



79. If the fault current is 3000 A for a relay with a plug setting of 50% and CT ratio of 1000:1, the plug setting multiplier would be
(1) 2.5 (2) 3.5
(3) 4 (4) 6
(5) Question not attempted
80. With respect to protective relays, evaluate the validity of the following statements :
a. The minimum current at which a relay just begins to operate is termed its pick-up value.
b. If a relay has a pick-up current of 7.5 A and is subjected to a fault current of 30 A, its plug-setting multiplier (PSM) is 5.
c. Earth fault currents are generally lower than three-phase short circuit currents.
d. Induction relays are suitable for operation on both a.c. and d.c. quantities.
Which of the above statements are correct ?
(1) b and c (2) a and b
(3) a, b and d (4) a and c
(5) Question not attempted
81. Limitation of HVDC system is :
(1) No skin effect
(2) Voltage transformation is not easier
(3) Poor voltage regulation
(4) Lower transmission losses
(5) Question not attempted
82. Heavy use of shunt capacitor compensation could lead to
(1) Reduction of small signal stability margin
(2) Improved voltage regulation
(3) Increased flow of active power
(4) Increased surge impedance
(5) Question not attempted
83. Out of following, which statement is not true with regard to desirable property in conductor material used for transmission and distribution of electrical power ?
(1) High electrical conductivity
(2) High specific gravity
(3) Low cost so that it can be used for long distances
(4) High tensile strength
(5) Question not attempted
84. Economiser is used to raise the temperature of
(1) Coal (2) Air
(3) Steam (4) Feed water
(5) Question not attempted
85. Nuclear power station is normally used for
(1) Peak load
(2) Base load
(3) Sudden change of loading condition
(4) Power factor correction
(5) Question not attempted
86. Positive sequence impedance of a fully transposed transmission line is
(1) 3 times negative sequence impedance
(2) $\frac{1}{3}$ of negative sequence impedance
(3) equal to negative sequence impedance
(4) always zero
(5) Question not attempted



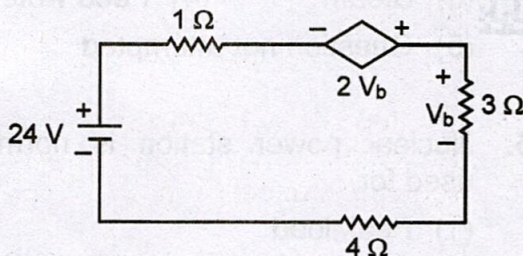
87. The total impedance $Z(j\omega)$ of the circuit shown below is



$Z(j\omega) \Rightarrow$

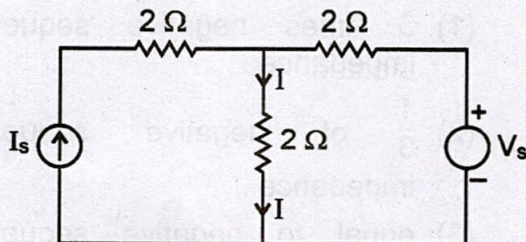
- (1) $(6 + j0)$ ohm (2) $(8 + j0)$ ohm
(3) $(0 + j8)$ ohm (4) $(6 + j8)$ ohm
(5) Question not attempted

88. The current in the given circuit is :



- (1) 10 A (2) 12 A
(3) 14 A (4) 16 A
(5) Question not attempted

89. For the circuit shown below, $V_s = 0$, when $I = 4$ Amp. The value of 'I' for $V_s = 16$ Volt is



- (1) 16 Amp (2) 8 Amp
(3) 4 Amp (4) 0 Amp
(5) Question not attempted

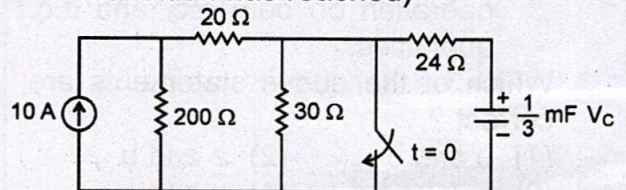
90. Two coils have self inductances, $L_1 = 1.6$ H and $L_2 = 0.1$ H. The coupling co-efficient between coils is 0.5, the turn ratio between the coils (N_1/N_2) is :

- (1) 1 (2) 2
(3) 3 (4) 4
(5) Question not attempted

91. The Laplace Transform of the function $f(t) = \cos(\omega t) \cdot u(t)$ is given by

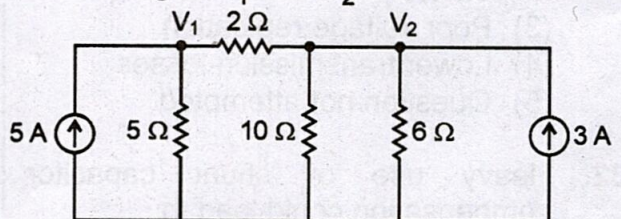
- (1) $\frac{s^2}{(s^2 + \omega^2)}$ (2) $\frac{s}{(s^2 + \omega^2)}$
(3) $\frac{s}{(s + \omega)}$ (4) $\frac{s}{(s^2 + 1)}$
(5) Question not attempted

92. For the circuit shown below, find the voltage across the capacitor before the switch is closed (steady state condition has reached)



- (1) 190 Volt (2) 240 Volt
(3) 0 Volt (4) 300 Volt
(5) Question not attempted

93. For the circuit shown below, nodal voltages V_1 and V_2 are :



- (1) $V_1 = 9.59$ V, $V_2 = 8.1$ V
(2) $V_1 = 18.59$ V, $V_2 = 16.02$ V
(3) $V_1 = 22.6$ V, $V_2 = 20.3$ V
(4) $V_1 = 25.5$ V, $V_2 = 15.06$ V
(5) Question not attempted



94. For a 2-port network, the voltage gain is given by

$$\frac{V_2(s)}{V_1(s)} = \frac{s}{(s+2)(s+3)}$$

for a unit-impulse input, the output of the network is :

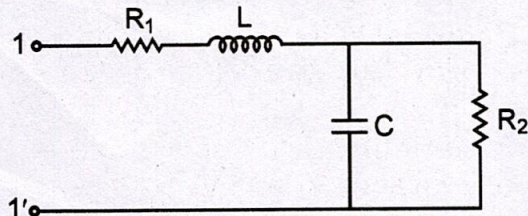
- (1) $v_2(t) = 2e^{-2t} + 3e^{-3t}$
 - (2) $v_2(t) = -2e^{-2t} + 3e^{-3t}$
 - (3) $v_2(t) = 2e^{-3t} + e^{-2t}$
 - (4) $v_2(t) = 4e^{-2t} - e^{-3t}$
 - (5) Question not attempted
95. The impedance of a parallel RLC circuit is given by

$$Z_s = \frac{s}{20(s^2 + 2s + 101)}$$

the resonance frequency of this circuit is :

- (1) 10.05 rad/sec
- (2) 5.25 rad/sec
- (3) 7.1 rad/sec
- (4) 14.21 rad/sec
- (5) Question not attempted

96. The driving point impedance at port 1-1' of the network shown below is :



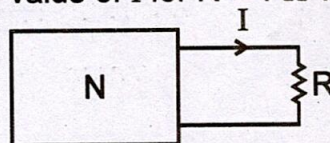
- (1) $R_1 + sL + \frac{R_2}{(1 + R_2Cs)}$
- (2) $R_2 + sL + \frac{R_1}{(1 + R_1Cs)}$
- (3) $R_1 + sL + \frac{1}{Cs} + R_2$
- (4) $R_1 + sL + \frac{R_1}{(1 + R_2Cs)}$
- (5) Question not attempted

97. A coil takes a current of 2 A when connected to a 240 V, 25 Hz sinusoidal supply, consumes 200 W. The inductance of coil is :



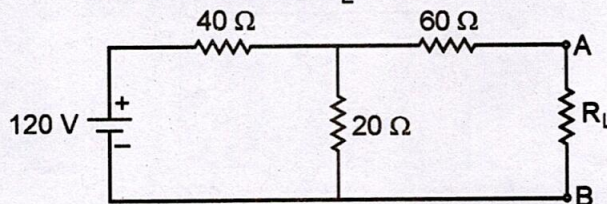
- (1) 0.347 H
- (2) 0.694 H
- (3) 0.173 H
- (4) 1.3 H
- (5) Question not attempted

98. The black-box N contains resistors and independent sources. If $I = 3$ A and 1.5 A for $R = 0$ and 2Ω , respectively, then what is the value of I for $R = 1 \Omega$?



- (1) 1 A
- (2) 2 A
- (3) 3 A
- (4) 4 A
- (5) Question not attempted

99. In the circuit shown below, for maximum power transfer, value of load resistance ' R_L ' is :



- (1) 136.7 Ω
- (2) 73.34 Ω
- (3) 146.68 Ω
- (4) 148.35 Ω
- (5) Question not attempted

100. Two coupled coils with $L_1 = 0.01$ H, $L_2 = 0.04$ H and $K = 0.6$ are connected in two different ways, Series Aiding and Series Opposing. The equivalent inductances in the two cases are :

- (1) 0.012 Henry and 0.074 Henry
- (2) 0.074 Henry and 0.012 Henry
- (3) 0.074 Henry and 0.026 Henry
- (4) 0.026 Henry and 0.074 Henry
- (5) Question not attempted



रफ कार्य के लिए स्थान / SPACE FOR ROUGH WORK

For 4.5 point question, the voltage gain is given by

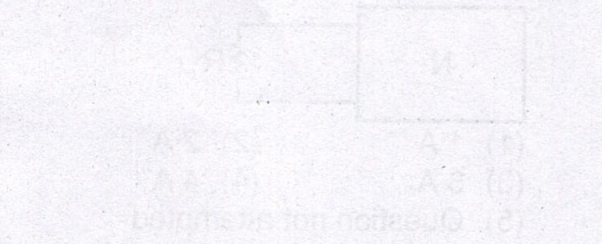
$$\frac{V_o(s)}{V_i(s)} = \frac{s}{s^2 + 2s + 3}$$

for a unit impulse input, the output of the network is

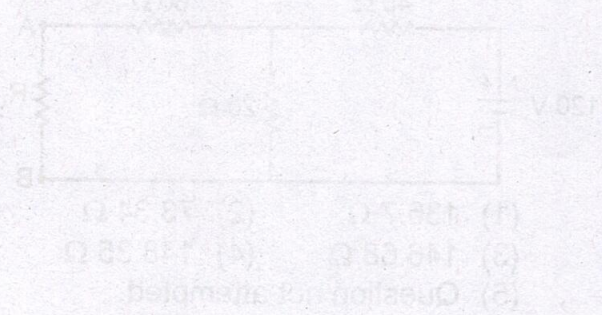
(1) $(t) = 2e^{-t} - 3e^{-3t}$
(2) $(t) = 2e^{-t} + 3e^{-3t}$
(3) $(t) = 2e^{-t} - 3e^{-3t}$
(4) $(t) = 2e^{-t} + 3e^{-3t}$

(b) Question not attempted

98. The black-box contains resistors and independent sources. If $I = 3\text{ A}$ and $V = 0$ and 2 A respectively, then what is the value of R for $V = 10\text{ V}$?



99. In the circuit shown below, for maximum power transfer, value of load resistance R_L is



100. Two coupled coils with $L_1 = 0.01\text{ H}$, $L_2 = 0.04\text{ H}$ and $K = 0.6$ are connected in two different ways. Series Aiding and Series Opposing. The equivalent inductances in the two cases are

- (1) 0.042 Henry and 0.074 Henry
(2) 0.074 Henry and 0.042 Henry
(3) 0.074 Henry and 0.074 Henry
(4) 0.042 Henry and 0.074 Henry
- (b) Question not attempted

101. The impedance of a parallel RLC circuit is given by

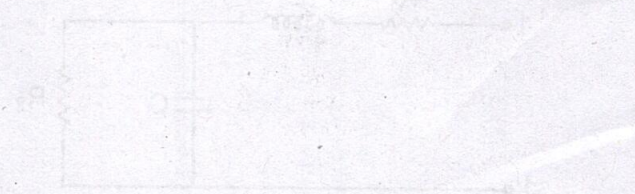
$$Z = \frac{R}{1 + R^2 C^2 \omega^2}$$

The resonance frequency of this circuit is

(1) 10.05 rad/sec
(2) 0.25 rad/sec
(3) 7.7 rad/sec
(4) 11.2 rad/sec

(b) Question not attempted

102. The driving-point impedance at port 1 of the network shown below is



RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

Asstt. Engineer (DOP(A-4/2)) Comb. Comp. (Pre.) Exam 2024

Subject : Electrical Engineering

Exam Date : 29-09-2025

Model Answer Key Issue Date : 13-10-2025

Answer key as per the Question Paper uploaded on Website

Q. No.	RES	Q. No.	RES
1	2	51	2
2	4	52	1
3	4	53	2
4	4	54	3
5	1	55	1
6	1	56	4
7	1	57	2
8	2	58	3
9	3	59	1
10	1	60	4
11	4	61	2
12	2	62	2
13	4	63	4
14	2	64	2
15	1	65	2
16	2	66	3
17	2	67	3
18	1	68	3
19	2	69	4
20	1	70	4
21	3	71	1
22	2	72	1
23	1	73	2
24	2	74	2
25	4	75	4
26	4	76	4
27	2	77	4
28	4	78	2
29	2	79	4
30	3	80	4
31	3	81	2
32	2	82	1
33	2	83	2
34	4	84	4
35	1	85	2
36	3	86	3
37	3	87	2
38	4	88	2
39	2	89	2
40	1	90	4
41	1	91	2
42	3	92	2
43	2	93	2
44	1	94	2
45	3	95	1
46	3	96	1
47	1	97	2
48	1	98	2
49	4	99	2
50	1	100	3

* Means deleted (if any)