A.E.N. Ex. 2018 परीक्षा दिनांक 17-12-18

पुस्तिका में पृष्ठों की संख्या–**16**
No. of pages in Booklet -**16**
पुस्तिका में प्रश्नों की संख्या–**100**
No. of Questions in Booklet -**100**
Subject Code – **03**
विषय / SUBJECT : **Electrical Engineering**

NEAP-81

PAPER-II

Question Paper Booklet No. प्रश्न–पत्र पुस्तिका संख्या
3003257

समय : **2.00** घण्टे
Time: **2.00** Hours

अधिकतम अंक : **200**
Maximum Marks: **200**

प्रश्न–पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील / पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न–पत्र पुस्तिका पर वही प्रश्न–पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है। इसमें कोई भिन्नता हो तो वीक्षक से दूसरा प्रश्न–पत्र प्राप्त कर लें। ऐसा न करने पर जिम्मेदारी अभ्यर्थी की होगी।

The candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same after opening the Paper Seal/ polythene bag. In case they are different, a candidate must obtain another Question Paper from the Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

1. **सभी** प्रश्नों के उत्तर दीजिए।
2. **सभी** प्रश्नों के अंक समान हैं।
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा।
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है। अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर पत्रक पर **नीले बॉल प्वॉइंट पेन** से गहरा करना है।
6. OMR उत्तर पत्रक इस परीक्षा पुस्तिका के साथ रखा है। जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर पत्रक निकाल कर ध्यान से केवल **नीले** बॉल प्वॉइंट पेन से विवरण भरें। **OMR उत्तर पत्रक पर प्रश्न–पत्र पुस्तिका संख्या ध्यानपूर्वक भरें।**
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। किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा।)
8. मोबाइल फोन अथवा 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।
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें। गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं।
10. यदि किसी प्रश्न में किसी प्रकार की कोई मुद्रण या तथ्यात्मक प्रकार की त्रुटि हो तो प्रश्न के हिन्दी तथा अंग्रेजी रूपान्तरों में से अंग्रेजी रूपान्तर मान्य होगा।

चेतावनी: *अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों–प्रावधानों के तहत कार्यवाही की जाएगी। साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है*

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.
2. **All** questions carry equal marks.
3. Only **one** answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN.**
6. The OMR Answer Sheet is kept with this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue** ball point pen only. **Please fill the Question Paper Booklet no. on the OMR Answer Sheet carefully.**
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. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.)
8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable materials with him/her will be strictly dealt as per rules.
9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.
10. If there is any sort of ambiguity/mistake either of printing or factual nature then out of Hindi and English Version of the question, the English Version will be treated as standard.

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 liable to be prosecuted. Department may also debar him/her permanently from all future examinations.*

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

ELECTRICAL ENGINEERING

1. The frequency of ripple in the output voltage of a three phase controlled bridge rectifier depends on-

   (1) firing angle **(2)** load inductance

   (3) load resistance **(4)** supply frequency

2. A thyristor has internal power dissipation of 40W and is operated at an ambient temperature of 20°C. If thermal resistance is 1.6°C/W, the junction temperature is-

   (1) 114°C **(2)** 164°C

   (3) 94°C **(4)** 84°C

3. A meter has a full-scale deflection of 90 degree at a current of 1 Ampere. The response of the meter is square law. Assuming spring control, the current for a deflection of 45 degree will be-

   (1) 0.25 Ampere **(2)** 0.50 Ampere

   (3) 0.67 Ampere **(4)** 0.707 Ampere

4. A 75 MVA, 10 kV synchronous generator has X_d = 0.4 p.u. The X_d value (in p.u.) to a base of 100 MVA, 11 kV is-

   (1) 5.78 **(2)** 0.279

   (3) 0.412 **(4)** 0.44

5. A cyclo-converter is operating on a 50 Hz supply. The range of output frequency that can be obtained with acceptable quality, is-

   (1) 0 – 16 Hz **(2)** 0 – 132 Hz

   (3) 0 – 64 Hz **(4)** 0 – 128 Hz

6. A 2 kVA transformer has iron loss of 150 Watts and full-load copper loss of 250 Watts. The maximum efficiency of the transformer would occur when the total loss is-

   (1) 500 W **(2)** 400 W

   (3) 300 W **(4)** 275 W

7. The system described by the following state equations-

   $$\dot{x} = \begin{bmatrix} 0 & 1 \\ 2 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; \quad y = [1 \quad 1]\, x$$

   1. Completely controllable
   2. Completely observable

   Which of the above statement is/are correct?

   (1) 1 only **(2)** 2 only

   (3) Both 1 and 2 **(4)** Neither 1 nor 2

8. An analog voltmeter uses external multiplier settings. With a multiplier setting of 20 kΩ, it reads 440 V and with a multiplier setting of 80 kΩ, it reads 352 V. For a multiplier setting of 40 kΩ the voltmeter reads-

   (1) 371 V **(2)** 383 V

   (3) 394 V **(4)** 406 V

9. The output Q_n of a J – K flip – flop is zero. It changes to 1 when a clock pulse is applied. The input J_n and K_n are, respectively-

(1) 1 and X (2) 0 and X

(3) X and 0 (4) X and 1

10. The Bode plot of the open – loop transfer function of a system is described as follows:

- Slope – 40 dB/decade ; $\omega < 0.1$ rad/s
- Slope – 20 dB/decade ; $0.1 < \omega < 10$ rad/s
- Slope 0 dB ; $\omega > 10$ rad/s

The system described will have-

(1) 1 pole and 2 zeros (2) 2 poles and 2 zeros

(3) 2 poles and 1 zero (4) 1 pole and 1 zero

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

(1) 20 MVA (2) 10 MVA

(3) 15 MVA (4) 5 MVA

12. A synchronous motor is floating on infinite mains at no load. If its excitation is now increased, it will draw-

(1) Unity power factor current (2) Zero power factor lagging current

(3) Zero power factor leading current (4) No current

13. Match list – I (Electromagnetic law) with list – II (differential form) and select the correct answer using the codes given below the lists-

	List – I		List – II
A.	Ampere's law	1.	$\nabla . \vec{D} = \rho_v$
B.	Faraday's law	2.	$\nabla . \vec{J} = -\frac{\partial \vec{H}}{\partial t}$
C.	Gauss law	3.	$\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$
D.	Current continuity equation	4.	$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

Codes:

	A	B	C	D
(1)	1	2	3	4
(2)	3	4	1	2
(3)	1	4	3	2
(4)	3	2	1	4

14. The open-loop transfer function of a feedback control system is given by-

$$\frac{G(s)}{H(s)} = \frac{K(s+2)}{s(s+4)(s^2+4s+8)}$$

One of following is a set of the centroid point coordinates, where asymptotes of the root loci of above transfer function meet in the s – plane:

(1) (-1, 0) (2) (-2, 0)

(3) $\left(\frac{-10}{3}, 0\right)$ (4) (2, 0)

15. The close-loop transfer function of a control system is given by $\frac{C(s)}{R(s)} = \frac{1}{(1+s)}$. For the input r(t) = sin(t), the steady state value of c(t) is equal to-

(1) $\frac{1}{\sqrt{2}}\cos(t)$ (2) 1

(3) $\frac{1}{\sqrt{2}}\sin(t)$ (4) $\frac{1}{\sqrt{2}}\sin(t - \frac{\pi}{4})$

16. If $\vec{H} = 0.1\sin(10^8 \pi t + \beta y)\,\hat{a}_x$ A/m for a plane wave propagating in free space, then the time average poynting vector is-

(1) $(0.6\pi \sin^2 \beta y)\,\hat{a}_y$ W/m^2 (2) $-0.6\pi\,\hat{a}_y$ W/m^2

(3) $1.2\pi\,\hat{a}_x$ W/m^2 (4) $-1.2\pi\,\hat{a}_x$ W/m^2

17. For any superconductor material, which statements are true out of the following statements that superconductivity can be destroyed by-

(i) increasing the temperature above a certain limit

(ii) applying a magnetic field above a certain limit

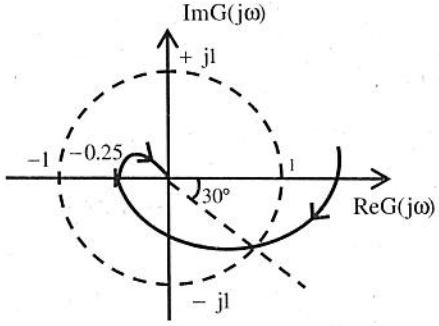
(iii) passing a current, above a certain limit, through the material

(iv) decreasing the temperature to a point below the critical temperature

(1) (ii), (iii) and (iv) are correct (2) (i), (iii) and (iv) are correct

(3) (i), (ii) and (iii) are correct (4) (i), (ii) and (iv) are correct

18. The polar plot (for positive frequencies) for the open loop transfer function of a unity feedback control system is shown in the given figure-



The phase margin and the gain margin of the system are respectively-

(1) 150° and 4 (2) 150° and ¾

(3) 30° and 4 (4) 30° and ¾

19. If the fault current is 2000 Ampere, the relay setting is 50% and CT ratio is 400/5, then the plug setting multiplier will be-

(1) 25 Amp. (2) 15 Amp.

(3) 50 Amp. (4) None of these

20. If the corona loss on a particular system at 50 Hz is 1 kW/phase/km, then corona loss on the surface of the same system with supply frequency at 25 Hz will be-

(1) 1 kW/phase/km (2) 0.5 kW/phase/km

(3) 0.667 kW/phase/km (4) None of these

21. Which one of the following is the steady-state error for a step input applied to a unity feedback system with the open loop transfer function-

$$G(s) = \frac{10}{s^2+14s+50}$$

(1) $e_{ss} = 0$ **(2)** $e_{ss} = 0.83$

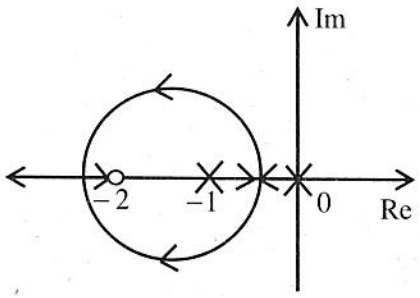
(3) $e_{ss} = 1$ **(4)** $e_{ss} = \infty$

22. For a p-pole machine, the relation between electrical (θ_e) and the mechanical angle (θ_m) degrees is given by-

(1) $\theta_e = \frac{P}{(2 * \theta_m)}$ **(2)** $\theta_m = \left(\frac{P}{2}\right) * \theta_e$

(3) $\theta_e = \theta_m$ **(4)** $\theta_e = \left(\frac{P}{2}\right) * \theta_m$

23. The below figure shows the root locus of a unity feedback system. The open loop transfer function of the system is-



(1) $\frac{k}{s(s+1)(s+2)}$ **(2)** $\frac{k\,s}{(s+1)(s+2)}$

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

24. If in a 3-phase, half-wave inverter, if per phase input voltage is 200 V, then the average output voltage is-

(1) 233.91 V **(2)** 116.95 V

(3) 202.56 V **(4)** 101.28 V

25. In a unity feedback control system with $G(s) = \frac{4}{s^2+0.4s}$ when subjected to unit step input, it is required that system response should be settled within 2% tolerance band, the system settling time is-

(1) 1s **(2)** 2s

(3) 10s **(4)** 20s

26. The rotor power output of 3 – phase induction motor is 15 kW. The rotor copper losses at a slip of 4% will be-

(1) 600 W **(2)** 625 W

(3) 650 W **(4)** 700 W

27. Stability of a power system can be improved by-

(1) Using series compensators

(2) Using parallel transmission lines

(3) Reducing voltage of transmission

Which of the above statements are correct?

(1) 1 only **(2)** 2 only

(3) 2 and 3 **(4)** 1 and 2

28. Equal Area criterion is employed to determine-

(1) The steady state stability **(2)** The transient stability

(3) The reactive power limit **(4)** The rating of circuit breaker

29. In the case of a HVDC system, there is-

(1) charging current but no skin effect **(2)** no charging current but skin effect

(3) neither charging current nor skin effect **(4)** both charging current and skin effect

30. Steady state stability of a power system is improved by-

(1) reducing fault clearing time **(2)** using double circuit line instead of single circuit line

(3) single pole switching **(4)** decreasing generator inertia

31. Which one of the following interrupts is both level and edge sensitive?

(1) RST 7.5 **(2)** RST 5.5

(3) TRAP **(4)** INTR

32. The subroutine SBX given below is executed by an 8085 processor. The value in the accumulator immediately after the execution of the subroutine will be-

```
SBX : MVI  A, 99H
      ADI  11H
      MOV  C, A
      RET
```

(1) 00H **(2)** 11H

(3) 99H **(4)** AAH

33. An Intel 8085 microprocessor is executing the program given below-

```
      MVI A, 10H
      MVI B, 10H
BACK :NOP
      ADD B
      RLC
      JNC BACK
      HLT
```

The number of times that the operation NOP will be executed is -

(1) 1 **(2)** 2

(3) 3 **(4)** 4

34. Match List-I with List-II and select the correct answer using the code given below the lists:

List-I	List-II
A. Immediate addressing	1. LDA 30FF
B. Implicit addressing	2. MOV A, B
C. Register addressing	3. LXI H, 2050
D. Direct addressing	4. RRC

Code:	A	B	C	D
(1)	3	4	2	1
(2)	1	4	2	3
(3)	3	2	4	1
(4)	1	2	4	3

35. The crystal frequency of 8085 microprocessor is 6 MHz. The time required to execute instruction XTHL over this microprocessor is-

(1) 5.33 μs (2) 10.67 μs
(3) 4.33 μs (4) 8.67 μs

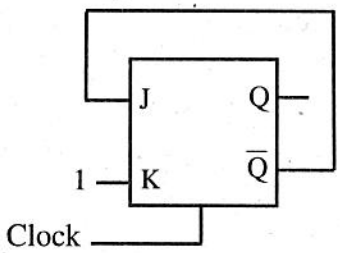
36. A computer employs RAM chips of 256 bytes and ROM chips of 1024 bytes. If the computer system needs 1 kB of RAM and 1 kB of ROM, then how many address lines are required to access the memory?

(1) 10 (2) 11
(3) 12 (4) 13

37. A BJT is biased with a power supply of 12V. For minimum heat dissipation, the drop across the transistor will be-

(1) 6V (2) 9V
(3) 12V (4) > 9V but < 12V

38. Consider the following J-K flip-flop:



In the above J-K flip–flop, J=$\overline{Q}$ and K=1. Assume that the flip-flop was initially cleared and then clocked for 6 pulses. What is the sequence at the Q output?

(1) 010000 (2) 011001
(3) 010010 (4) 010101

39. The maximum deviation allowed in an FM broadcast system is 75 kHz. If the modulating signal is of 10kHz, find the bandwidth of the FM signal.
(1) 85 kHz (2) 170 kHz
(3) 75 kHz (4) 340 kHz

40. An ammeter of range 0-25A has a guaranteed accuracy of 1% of full scale reading. The current measured by the ammeter is 5A. The limiting error in the reading is-
(1) 2% (2) 2.5%
(3) 4% (4) 5%

41. An LVDT produces an output of 24V rms for a displacement of 25×10^{-3}cm. This voltage is measured with a 5V full-scale voltmeter with 100 major divisions, each major division readable to 0.2 divisions. The resolution of the voltmeter is-
(1) 0.125 mm (2) 0.104×10^{-3} mm
(3) 1.25 mm (4) 10.4×10^{-3} mm

42. A $3\frac{1}{2}$ digit, 2V full scale dual slope ADC has its integration time set to 300ms. If the input to the ADC is (1 + 1 sin 314t)V, then the ADC output will be-
(1) 1.000 (2) 1.999
(3) 1.414 (4) 1.500

43. Which one of the following meters has maximum loading effect on the circuit under measurement?
(1) 1000 Ω/volt (2) 100 Ω/volt
(3) 1m Ω/volt (4) 10m Ω/volt

44. Hay bridge is suitable for measuring inductance of which one of the following inductors?
(1) Having Q value less than 10 (2) Having Q value greater than 10
(3) Of any value of Q (4) Having phase angle of reactance very large

45. In a PCM system of telemetry, the quantization noise depends on -
(1) The sampling rate and quantization levels (2) The sampling rate only
(3) The number of quantization levels only (4) Information provided is not sufficient

46. Which one of the following capacitor-star split-phase induction motors will have the largest value of capacitance?
(1) 94W, 3450 rpm (2) 187 W, 1725 rpm
(3) 373W, 1140 rpm (4) 560 W, 1140 rpm

47. In a power transformer, the core loss is 50W at 40Hz and 100W at 60Hz, under the condition of same maximum flux density in both cases. The core loss at 50Hz will be-
(1) 64 W (2) 73 W
(3) 82 W (4) 91 W

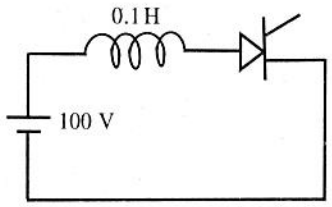
48. The maximum power delivered by 15kW, 3-phase, star connected, 4kV, 48 pole 50Hz synchronous motor with synchronous reactance of 4Ω per phase and unit power factor is-
(1) 4271.2 kW (2) 3505 kW
(3) 1206.1 kW (4) 2078 kW

49. A three-pulse converter has a freewheeling diode across its load. The operating range of the converter is-

(1) $0° \leq \alpha \leq 150°$ **(2)** $60° \leq \alpha \leq 120°$

(3) $30° \leq \alpha \leq 150°$ **(4)** $180° \leq \alpha \leq 360°$

50. The latching current of SCR in the below circuit is 4mA. The minimum width of the gate pulse required to turn-on the thyristor is-



(1) 6 μs **(2)** 4 μs

(3) 2 μs **(4)** 1 μs

51. In dc choppers, per unit ripple is maximum, when the duty cycle 'α' is-

(1) 0.2 **(2)** 0.5

(3) 0.7 **(4)** 0.9

52. Match List-I with List-II and select the correct answer using the code given below the lists-

	List – I		List –II
A.	Ferrite	1.	Meissner effect
B.	Superconductor	2.	Faraday effect
C.	Quartz	3.	Hysteresis
D.	Iron	4.	Piezoelectricity

Codes:	A	B	C	D
(1)	3	1	4	2
(2)	2	1	4	3
(3)	3	4	1	2
(4)	2	4	1	3

53. The undesirable property of an electrical insulating material is-

(1) high dielectric strength **(2)** high relative permittivity

(3) low density **(4)** High insulation resistivity

54. An overhead line having a surge impedance of 400Ω is connected in series with an underground cable having a surge impedance of 100Ω. If a surge of 50 kV travels from the line end towards the line-cable junctions, the value of the transmitted voltage wave at the junction is-

(1) 30 kV **(2)** 20 kV

(3) 80 kV **(4)** -30 kV

55. Darlington pair arrangement provides-

(1) Very high β value **(2)** Very low β value

(3) Same β as of one transistor **(4)** None of the above

56. Which type of motor is most suitable for computer printer drive?

(1) Reluctance motor (2) Hysteresis motor

(3) Shaded pole motor (4) Stepper motor

57. If the length of a wire of resistance 'R' is uniformly stretched to 'n' times its original value, its new resistance is-

(1) nR (2) R/n

(3) n^2/R (4) R/n^2

58. Which of the following statement holds for the divergence of electric and magnetic flux densities?

(1) both are zero (2) these are zero for static densities but non zero for time varying densities

(3) it is zero for the electric flux density (4) it is zero for the magnetic flux density

59. The bridge method commonly used for finding mutual inductance is-

(1) Heaviside Campbell bridge (2) Schering bridge

(3) De Sauty bridge (4) Wien bridge

60. An op-amp, having a slew rate of 62.8 V/μ sec, is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoid is 10V, then the minimum frequency at which the slew rate limited distortion would set in at the output is-

(1) 1.0 MHz (2) 6.28 MHz

(3) 10.0 MHz (4) 62.8 MHz

61. A rolled-paper capacitor of value 0.02 μf is to be constructed using two strips of Aluminium of width 6cm, and wax impregnated paper of thickness 0.06 mm, whose relative permittivity is 3. The length of foil strips should be-

(1) 0.3765 m (2) 0.4765 m

(3) 0.5765 m (4) 0.7765 m

62. A series R-L-C circuit has R=50W, L= 100 μH and C=1μF. The lower half power frequency of the circuit is-

(1) 30.55 kHz (2) 3.055 kHz

(3) 51.92 kHz (4) 1.92 kHz

63. A 800 kV transmission line is having per phase line inductance of 1.1 mH/km and per phase line capacitance of 11.68 nF/km. Ignoring the length of the line, its ideal power transfer capability in MW is-

(1) 1204 (2) 1504

(3) 2085 (4) 2606

64. The armature of a single phase alternator is completely wound with T single turn coils distributed uniformly. The induced voltage in each turn is 2V(rms). The emf of the whole winding is-

(1) 2 T Volt (2) 1.11 T Volt

(3) 1.414 T Volt (4) 1.273 T Volt

65. An 8 pole, DC generator has a simplex wave-wound armature containing 32 coils of 6 turns each. Its flux per pole is 0.06 Wb. The machine is running at 250 rpm. The induced armature voltage is-

(1) 96 (2) 192

(3) 384 (4) 768

66. The velocity of light in a particular medium is 10^8 m/s. What is the relative permittivity of the medium?

(1) 1.732 (2) 3

(3) 9 (4) 0.333

67. A dc to dc transistor chopper supplied from a fixed voltage DC source feeds a fixed resistive-inductive load and a free-wheeling diode. The chopper operates at 1 kHz and 50% duty cycle. Without changing the value of the average dc current through the load, if it is desired to reduce the ripple content of load current, the control action needed will be-

(1) increase the chopper frequency keeping its duty cycle constant.

(2) increase the chopper frequency and duty cycle in equal ratio.

(3) decrease only the chopper frequency.

(4) decrease only the duty cycle.

68. A PWM switching scheme is used with a three phase inverter to -

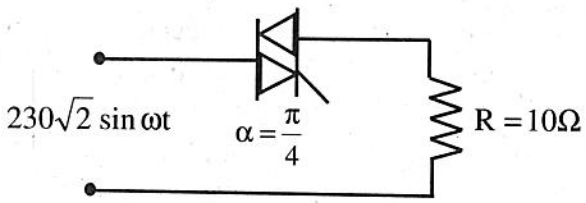
(1) reduce the total harmonic distortion with modest filtering

(2) minimize the load on the DC side

(3) increase the life of the batteries

(4) reduce low order harmonics and increase high order harmonics

69. The triac circuit shown in Figure controls the ac output power to the resistive load. The peak power dissipation in the load is –

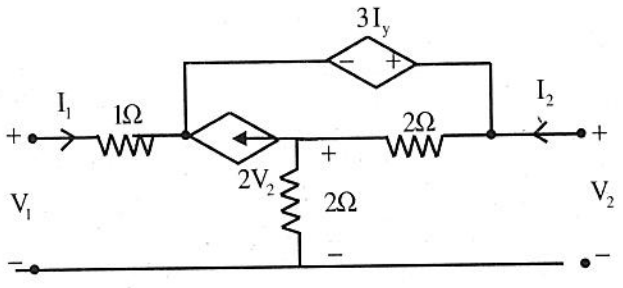


Figure

(1) 3968 W (2) 5290 W

(3) 7935 W (4) 10100 W

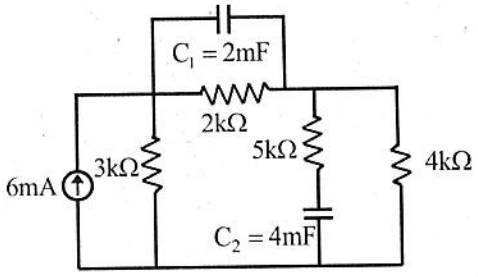
70. For the circuit shown below, the input resistance $R_{11} = \left.\frac{V_1}{I_1}\right| I_2 = 0$ is-



(1) -3Ω (2) 3Ω

(3) 12Ω (4) 13Ω

71. Obtain the energy stored in each capacitor as shown in figure below under DC conditions:



(1) 16 mJ, 68 mJ (2) 32 mJ, 68 mJ

(3) 32 mJ, 64 mJ (4) 16 mJ, 128 mJ

72. The number of comparisons carried out in a 4 bit flash-type A/D converter is-

(1) 16 (2) 15

(3) 4 (4) 3

73. In an 8085 microprocessor, the contents of accumulator, after the following instructions are executed will become-

XRA A
MVIB F0 H
SUB B

(1) 01 H (2) 0F H

(3) F0 H (4) 10 H

74. Laplace transform of $\sin^3 2t\, u(t)$ is-

(1) $\frac{24}{(s^2+4)(s^2+36)}$ (2) $\frac{1}{(s^2+4)(s^2+64)}$

(3) $\frac{48}{(s^2+4)(s^2+36)}$ (4) $\frac{64}{(s^2+4)(s^2+36)}$

75. For a feedback control system of type-2, the steady state error for a ramp input is

(1) infinity (2) constant

(3) zero (4) indeterminate

76. The phase lead compensation is used to-

(1) Increase rise time and decrease overshoot.

(2) Decrease both rise time and overshoot.

(3) Increase both rise time and overshoot.

(4) Decrease rise time and increase overshoot.

77. A 0-10 mA PMMC ammeter reads 4mA in a circuit. Its bottom control spring snaps suddenly. The meter will now read nearly-

(1) 10 mA **(2)** 8 mA

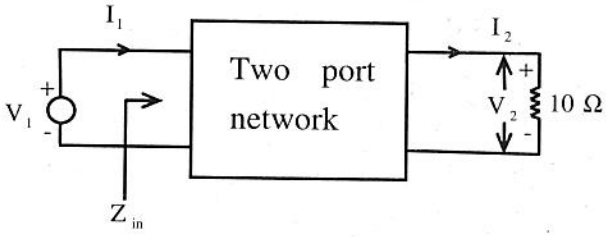
(3) 2 mA **(4)** zero

78. Two systems with impulse responses $h_1(t)$ and $h_2(t)$ are connected in cascade. Then the overall impulse response of the cascaded system is given by-

(1) Product of $h_1(t)$ and $h_2(t)$ **(2)** Sum of $h_1(t)$ and $h_2(t)$

(3) Convolution of $h_1(t)$ and $h_2(t)$ **(4)** Subtraction of $h_1(t)$ and $h_2(t)$

79. If the transmission parameters of the below network are A=C=1, B=2 and D=3, then the value of Z_{in} is-



(1) $\frac{12}{13}\Omega$ **(2)** $\frac{13}{12}\Omega$

(3) 3Ω **(4)** 4Ω

80. For a power system network with n nodes, Z_{33} of its bus impedance matrix is j 0.5 per unit. The voltage at node 3 is $1.3 \angle 10°$ per unit. If a capacitor having reactance of –j 3.5 per unit is now added to the network between node 3 and the reference node, the current drawn by the capacitor per unit is-

(1) $0.325 \angle 100°$ **(2)** $0.325 \angle 80°$

(3) $0.371 \angle 100°$ **(4)** $0.433 \angle 80°$

81. The binary equivalent of hexadecimal number 4FAD is-

(1) 0101 1111 0010 1100 **(2)** 0100 1111 0010 1100

(3) 0100 1111 1010 1101 **(4)** 0100 1110 0010 1101

82. The Boolean expression $ABCD+A\bar{B}CD+ABC\bar{D}+A\bar{B}C\bar{D}$ is equivalent to-

(1) A **(2)** AC

(3) ABC **(4)** 1

83. For a periodic square wave, which one of the following statements is TRUE?

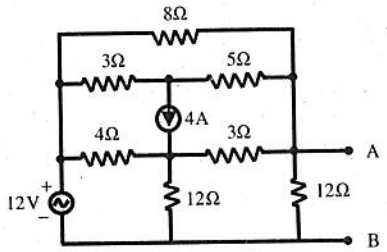
(1) The Fourier Series Coefficients do not exist.

(2) The Fourier Series Coefficients exist but the reconstruction converges at no point.

(3) The Fourier Series Coefficients exist and the reconstruction converges at most point.

(4) The Fourier Series Coefficients exist and the reconstruction converges at every point.

84. What is the Thevenin resistance seen from the terminal AB of the circuit shown in figure below?



(1) 2Ω
(2) 4Ω
(3) 8Ω
(4) 12Ω

85. Which of the following is a non-conventional source of energy?
(1) Nuclear
(2) Coal fired
(3) Wind
(4) Gas fired

86. A power system has 100 buses including 10 generator buses. For the load flow analysis using Newton-Raphson method in polar coordinates, the size of the jacobian is-
(1) 189*189
(2) 100*100
(3) 90*90
(4) 180*180

87. A single-phase transformer has no-load loss of 64 W, as obtained from an open-circuit test. When a short-circuit test is performed on it with 90% of the rated currents flowing in its both LV and HV windings, the measured loss is 81W. The transformer has maximum efficiency when operated at-
(1) 50.0% of the rated current
(2) 64.0% of the rated current
(3) 80.0% of the rated current
(4) 88.8% of the rated current

88. A field $\bar{A}=3x^2yz\ \bar{a}_x+x^3z\,\bar{a}_y+(x^3y-2z)\bar{a}_z$ can be termed as-
(1) Irrotational
(2) Divergenceless
(3) Solenoidal
(4) Rotational

89. A zero to 300 voltmeter has guaranteed accuracy of one percent full scale reading. The voltage measured by the instrument is 83 Volt. The percent limiting error is-
(1) 0.95
(2) 1.81
(3) 3.62
(4) 4.85

90. For a "two-port reciprocal" network, the output open-circuit voltage divided by the input current is equal to-
(1) $\frac{1}{h_{12}}$
(2) z_{12}
(3) $\frac{1}{y_{12}}$
(4) h_{12}

91. A plane wave is travelling in the positive X-direction in a lossless unbounded medium having permeability same as the free space and a permittivity 9 times that of the free space, the phase velocity of the wave will be-
(1) 3×10^8 m/s
(2) 10^8 m/s
(3) $\frac{1}{3}\times10^8$ m/s
(4) $\sqrt{3}\times10^8$ m/s

92. The line A to neutral voltage is $10 \angle 15°$ V for a balanced three phase star-connected load with phase sequence ABC. The voltage of line B with respect to line C is given by-

(1) $10\sqrt{3} \angle 105°$ V
(2) $10 \angle 105°$ V
(3) $10\sqrt{3} \angle -75°$ V
(4) $10\sqrt{3} \angle -90°$ V

93. A hollow metallic sphere of radius r is kept at potential of 1 Volt. The total electric flux coming out of the concentric spherical surface of radius R(>r) is -

(1) $4\pi\varepsilon r$
(2) $4\pi\varepsilon r^2$
(3) $4\pi\varepsilon rR$
(4) $\pi\varepsilon R^2$

94. A potential field is given by $\phi = 2xy^2 - 3y^2z$. If $\hat{x}$, $\hat{y}$ and $\hat{z}$ are the unit vectors along x, y and z directions respectively, the field intensity at (0, 1, 0) is-

(1) 0 V/m
(2) $2\hat{x} - 3\hat{z}$
(3) $-2\hat{x} + 3\hat{z}$
(4) $2\hat{x} + 3\hat{z}$

95. If in a transistor, $\alpha = 0.98$, I_{CO}=6 micro Ampere and I_B = 100 micro Ampere, then the value of I_C will be-

(1) 2.3 milli Ampere
(2) 3.1 milli Ampere
(3) 4.6 milli Ampere
(4) 5.2 milli Ampere

96. The driving-point impedance of a one –port reactive network (say LC network) is given by-

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

97. For sea water with $\sigma = 5$ mho/m and $\varepsilon_r = 80$, what is the distance for which radio signal can be transmitted with 90% attenuation at 25kHz?

(1) 0.322 m
(2) 3.22 m
(3) 32.2 m
(4) 322 m

98. When a bipolar junction transistor is operating in the saturation mode, which one of the following statement is TRUE about the state of its collector-base (CB) and the base-emitter (BE) junctions?

(1) The CB junction is forward biased and the BE junction is reverse biased.
(2) The CB junction is reversed and the BE junction is forward biased.
(3) Both the CB and BE junctions are forward biased.
(4) Both the CB and BE junctions are reverse biased.

99. A 4-pole, separately excited, wave wound DC machine with negligible armature resistance is rated for 230 V and 5kW at a speed of 1200 rpm. If the same armature coils are reconnected to form a lap winding. What is the rated voltage (in volts) and power (in kW) respectively at 1200 rpm of the reconnected machine if the field circuit is left unchanged?

(1) 230 and 5
(2) 115 and 5
(3) 115 and 2.5
(4) 230 and 2.5

100. A cascade of three identical modulo-5 counters has an overall modulus of-

(1) 5
(2) 25
(3) 125
(4) 625

_____XX_____

Space for Rough Work