

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Subject Code :

1 4

Test Booklet No. :

00942

TEST BOOKLET

ELECTRONICS

Time Allowed : 2 (Two) Hours

Full Marks : 200

INSTRUCTIONS

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Subject Code shall be written legibly and correctly in the space provided on the Answer Sheet with black ball pen.
2. **Space provided for Series in the Answer Sheet is not applicable for Optional Subject. So the space shall be left blank.**
3. All questions carry equal marks. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet.
4. No candidate shall be admitted to the Examination Hall/Room 20 minutes after commencement of distribution of the paper. The Supervisor of the Examination Hall/Room will be the time-keeper and his/her decision in this regard is final.
5. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
6. No Mobile Phone, Pager, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Pager, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
7. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected paper permitted by the Commission.
8. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
9. After you have completed filling in all your responses on the Answer Sheet and the Examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
10. Violation of any of the above Rules will render the candidate liable to expulsion from the Examination Hall/Room and disqualification from the Examination, and according to the nature and gravity of his/her offence, he/she may be debarred from future Examinations and Interviews conducted by the Commission for appointment to Government Service.
11. Smoking inside the Examination Hall/Room is strictly prohibited.
12. **This Test Booklet contains one sheet (two pages) for Rough Work at the end.**

SEAL

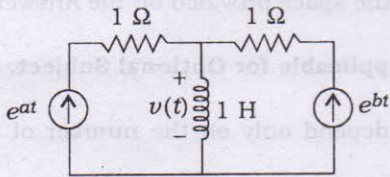
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[No. of Questions : 100]

1. How many 200 W/220 V incandescent lamps connected in series would consume the same total power as a single 100 W/220 V incandescent lamp?

- (A) Not possible
- (B) 4
- (C) 3
- (D) 2

2. In the circuit given below, what will be the value of voltage $v(t)$?

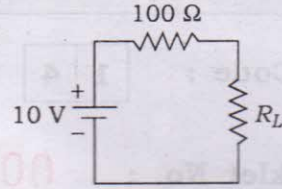


- (A) $e^{at} + e^{bt}$
- (B) $e^{at} - e^{bt}$
- (C) $ae^{at} + be^{bt}$
- (D) $ae^{at} - be^{bt}$

3. An electric circuit with 10 branches and 7 nodes will have how many independent loops?

- (A) 3
- (B) 4
- (C) 7
- (D) 10

4. In the circuit given below



the maximum power that can be transferred to the load resistance R_L from the voltage source will be

- (A) 1 W
- (B) 10 W
- (C) 0.25 W
- (D) 0.5 W

5. In a linear circuit, the superposition principle can be applied to calculate the

- (A) voltage and power
- (B) current and power
- (C) voltage and current
- (D) voltage, current and power

6. A series $R-L-C$ circuit has resonance frequency of 1 kHz and a quality factor $Q = 100$. If each of R , L and C is doubled from its original value, the new Q of the circuit is

- (A) 25
- (B) 50
- (C) 100
- (D) 200

7. The nodal method of circuit analysis is based on

- (A) KVL and Ohm's law
- (B) KCL and Ohm's law
- (C) KCL and KVL
- (D) KCL, KVL and Ohm's law

8. In a series R - L - C circuit, $R = 2 \text{ k}\Omega$, $L = 1 \text{ H}$ and $C = \frac{1}{400} \mu\text{F}$. The resonance frequency is

- (A) $2 \times 10^4 \text{ Hz}$
- (B) $\frac{1}{\pi} \times 10^4 \text{ Hz}$
- (C) 10^4 Hz
- (D) $2\pi \times 10^4 \text{ Hz}$

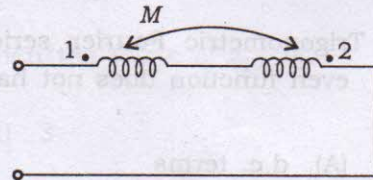
9. If two identical 3 A , 4Ω Norton equivalent circuits are connected in parallel with like polarity, the combined Norton equivalent circuit will be

- (A) 3 A , 8Ω
- (B) 6 A , 8Ω
- (C) 0 A , 2Ω
- (D) 6 A , 2Ω

10. Which of the following theorems can be applied to any network, i.e., linear or non-linear, active or passive, time variant or time invariant?

- (A) Thevenin's theorem
- (B) Norton's theorem
- (C) Tellegen's theorem
- (D) Superposition theorem

11. The equivalent inductance measured between terminals 1 and 2 for the circuit given in the figure below is



- (A) $L_1 + L_2 + M$
- (B) $L_1 + L_2 - M$
- (C) $L_1 + L_2 + 2M$
- (D) $L_1 + L_2 - 2M$

12. A signal $x(t)$ has a Fourier transform $X(\omega)$. If $x(t)$ is a real and odd function of t , then $X(\omega)$ is

- (A) a real and even function of ω
- (B) an imaginary and odd function of ω
- (C) an imaginary and even function of ω
- (D) a real and odd function of ω

13. Two coils have self-inductances of 0.09 H and 0.01 H, and a mutual inductance of 0.015 H. The coefficient of coupling between the two coils is

- (A) 0.06
- (B) 0.5
- (C) 0.05
- (D) 1.0

14. Trigonometric Fourier series of an even function does not have the

- (A) d.c. terms
- (B) cosine terms
- (C) sine terms
- (D) odd harmonic terms

15. Which of the following cannot be the Fourier series?

- (A) $x(t) = 2\cos t + 3\cos 3t$
- (B) $x(t) = 2\cos \pi t + 7\cos t$
- (C) $x(t) = \cos t + 0.5$
- (D) $x(t) = 2\cos 1.5\pi t + \sin 3.5\cos \pi t$

16. Which of the following functions is a periodic one?

- (A) $\sin(10\pi t) + \sin(20\pi t)$
- (B) $\sin(10t) + \sin(20\pi t)$
- (C) $\sin(10\pi t) + \sin(20t)$
- (D) $\sin(10t) + \sin(25t)$

17. Which of the following conditions is true for even function?

- (A) $f(t) = f(n \pm T/2)$
- (B) $f(t) = -f(t)$
- (C) $f(t) = f(-t)$
- (D) $f(t) = f(T)$

18. The z-transform $F(z)$ of the function $f(nT) = a^{nT}$ is

- (A) $\frac{z}{z - a^T}$
- (B) $\frac{z}{z + a^T}$
- (C) $\frac{z}{z - a^{-T}}$
- (D) $\frac{z}{z + a^{-T}}$

