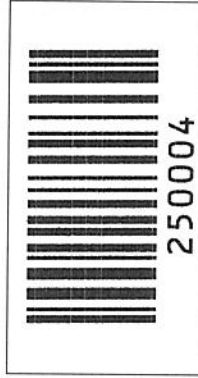


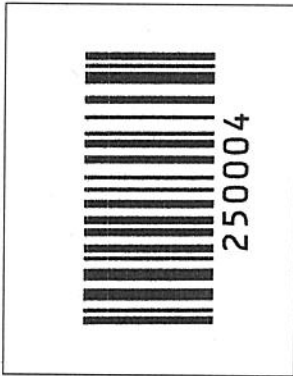
Subject : Electrical Engg. - I



Paper Code:	04
Total Pages :	
Time	3 Hours
Maximum Marks :	200

PART - I

Paper Code 04
Subject Electrical Engg. - I



TO BE FILLED BY THE CANDIDATE

Roll No. (In words)	
Name of the candidate	<i>S. J. S.</i>
Date of Birth (DD/MM/YYYY)	<i>01/12/01</i>
Father's Name	<i>S. J. S.</i>
Signature of the candidate	<i>S. J. S.</i>
Date of Examination	

Roll No.					
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4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Invigilator must check the Roll No. and Photo ID. of the candidate, then Sign. here :

[Signature box]

TO BE FILLED BY INVIGILATOR

If candidate found using unfair means them Invigilator should fill up this bubble with black/blue ball pen & report to the Centre Superintendent:

[Bubble]



IMPORTANT NOTES

महत्त्वपूर्ण निर्देश

- (A) Please fill up the OMR Sheet of this Question-Answer Booklet properly before answering.
प्रश्नोत्तर पुस्तिका में प्रश्न हल करने से पूर्व उसके संलग्न ओ.एम.आर. पत्रक को भली प्रकार से भर लें ।
- (B) The question paper is divided into different unit and parts. The number of questions to be attempted and their marks are indicated in each unit and parts.
प्रश्न-पत्र विभिन्न यूनिट एवं भागों में विभाजित है । प्रत्येक यूनिट एवं भाग में से किये जाने वाले प्रश्नों की संख्या और उनके अंक उस यूनिट एवं भाग में अंकित किये गए हैं ।
- (C) Attempt answers either in **Hindi or English**, not in both. For Language Papers, answer in concerned language and script, unless directed otherwise to write in Hindi or English specifically.
उत्तर अंग्रेजी या हिन्दी भाषा में से किसी एक में दीजिये, दोनों में नहीं । भाषा विषयक प्रश्नों के उत्तर उनकी संबद्ध भाषा व लिपि में ही दिए जाएँ, जब तक कि प्रश्न विशेष के लिए अलग से हिंदी या अंग्रेजी में उत्तर देने के लिए न लिखा गया हो ।
- (D) The candidates should not write the answers beyond the prescribed limit of words; failing this, marks will be deducted.
अभ्यर्थियों को अपने उत्तर निर्धारित शब्दों की सीमा से अधिक नहीं लिखना चाहिए । इसका उल्लंघन करने पर अंक काटे जायेंगे ।
- (E) Please write answers only in the prescribed space of booklet. Do not write any mark of identity inside the Answer Script (including Paper for rough work) i.e. name, address, telephone number, Name of God etc. or any irrelevant words other than the answer of question. Such act will be treated as unfair means. The Commission may also deduct 5 marks from the marks obtained, if Roll Number is not filled correctly on the O.M.R. Sheet.
किसी भी प्रश्न का उत्तर प्रश्नोत्तर पुस्तिका में निर्धारित स्थान पर ही लिखें । प्रश्नोत्तर पुस्तिका (रफ़ कार्य के पृष्ठ सहित) के अंदर कहीं पर भी अपना नाम, रोल नंबर अथवा अन्य कोई पहचान चिह्न यथा -- प्रश्नोत्तर में नाम, पता, दूरभाष नंबर, देवताओं के नाम अथवा अन्य कोई भी प्रश्नोत्तर से असम्बंधित शब्द, वाक्य एवं अंक आदि न लिखें । ऐसा करने पर आयोग द्वारा इसे अनुचित साधन अपनाने का कृत्य माना जायेगा । ओ.एम.आर. पत्रक पर रोल नम्बर का त्रुटिपूर्ण अंकन करने पर आयोग द्वारा उसके प्राप्तियों में से 5 अंक भी काटे जा सकते हैं ।
- (F) Candidates are directed that they should not write (answer) out side the border line in every page. Answer written out side the border line will not be checked by the Examiner.
अभ्यर्थियों को निर्देशित किया जाता है कि प्रश्नोत्तर पुस्तिका में प्रत्येक पृष्ठ में बनाई गई बार्डर लाईन से बाहर प्रत्युत्तर नहीं लिखें । बार्डर लाईन के बाहर लिखे गये उत्तर को परीक्षक द्वारा जाँचा नहीं जायेगा ।
- (G) 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.
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 ।
- (H) It should be ensured that the Question-Answer Booklet is provided in a sealed envelope to the candidate.
अभ्यर्थी यह सुनिश्चित कर लें कि अभ्यर्थी को प्रश्नोत्तर पुस्तिका सीलबंद लिफाफे में प्रदान की गई है ।
- (I) Candidate should fill up all desired details on this attached OMR sheet of Question-Answer Booklet with **blue** ball point pen. Please ensure that this OMR Sheet is not torn or damaged.
अभ्यर्थी प्रश्नोत्तर पुस्तिका के ऊपर संलग्न इस ओ.एम.आर. पत्रक पर सभी वांछित विवरण **नीले** बॉल पेन से सावधानीपूर्वक भरें । ध्यान रखें कि यह ओ.एम.आर. पत्रक कहीं से कटे-फटे नहीं अथवा किसी भी प्रकार से क्षतिग्रस्त नहीं हो ।
- (J) This **OMR** Sheet consists of **Two** parts, in which some information is pre-printed; remaining details have to be filled by the candidate.
यह ओ.एम.आर. पत्रक दो भागों में बंटा है, जिसमें कतिपय सूचनाएँ पूर्वमुद्रित हैं । शेष की पूर्ति अभ्यर्थी को करनी है ।
- (K) If the Question-Answer Booklet is torn or not printed properly, bring it to notice of invigilator and change the Question-Answer booklet, otherwise the candidate will be liable for that.
यदि प्रश्नोत्तर पुस्तिका कहीं से कटी-फटी या अमुद्रित है, तो अभिजागर के ध्यान में ला दें तथा उसे बदलवा लें, अन्यथा उसका दायित्व अभ्यर्थी का होगा ।

विशेष नोट :

अभ्यर्थी द्वारा यदि ओ.एम.आर. पत्रक पर गलत सूचना भरी जाती है या उसे किसी प्रकार की क्षति पहुँचाई जाती है अथवा उस पर किसी प्रकार का पहचान चिह्न अंकित किया जाता है, तो आयोग द्वारा संपूर्ण परीक्षा हेतु अभ्यर्थिता निरस्त की जा सकेगी और उसके लिए अभ्यर्थी उत्तरदायी होगा ।

Special Notes :

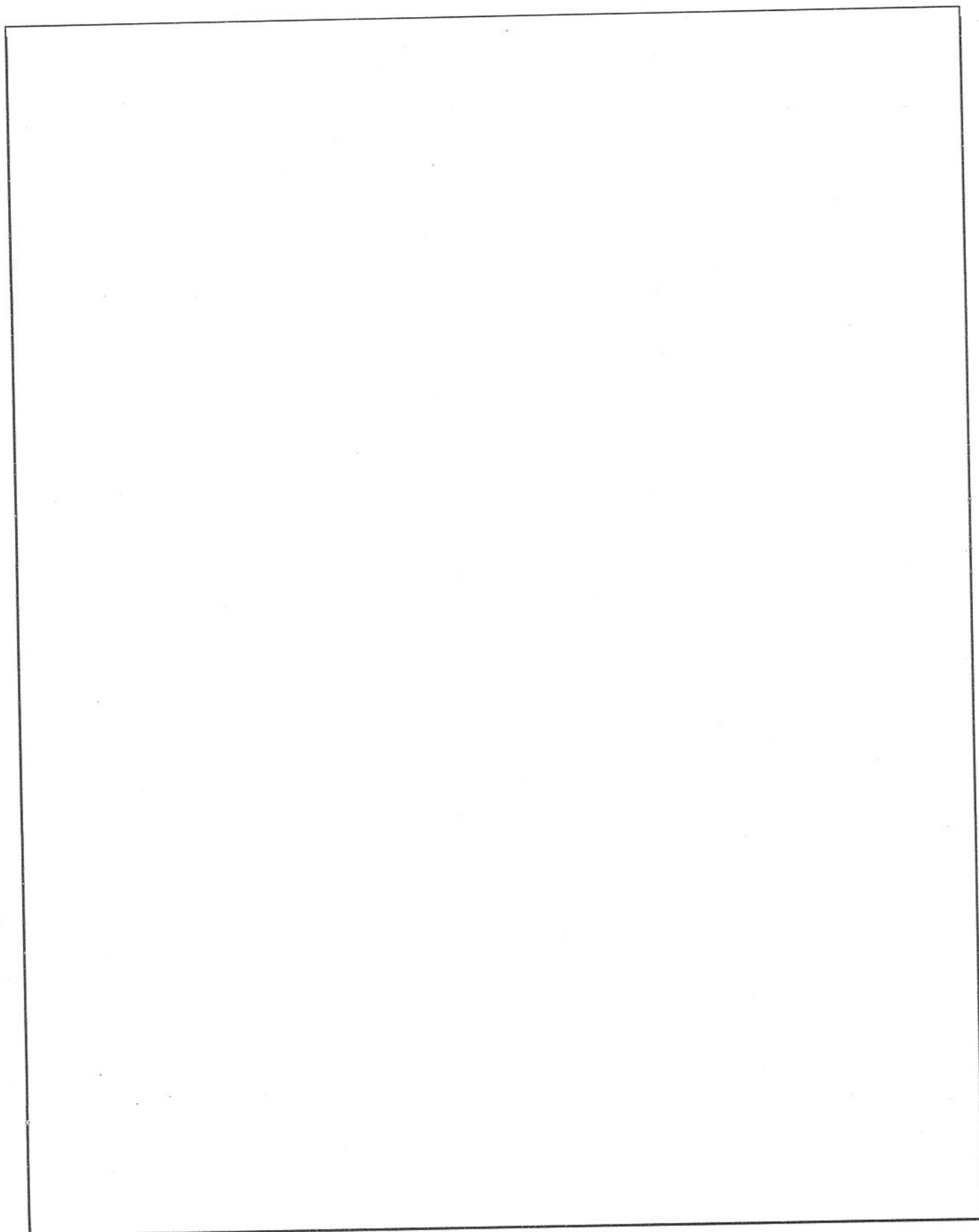
If there is any wrong information filled by the candidate or any attempt is made to damage it or any marking as identification is done, then his candidature for the entire examination shall be rejected by the commission, for which he will be liable.

04

4



SPACE FOR ROUGH WORK





Paper – I
ELECTRICAL ENGINEERING – I

(Total 200 Marks)
(Total 37 Question)

PART – A

Note : Attempt **all** questions. Answer the following questions in **15** words each. Each question carries **2** marks.

1. A network contains linear resistors, which are connected in series across an ideal voltage source. If all the resistances are halved and the voltage is doubled, then what will be the voltage across each resistor ?

2. Write the characteristic equation of the series RLC circuit.

3. Two mutually coupled coils of inductances 1.8 mH and 5 mH has mutual inductance of 2.5 mH. Find the coupling coefficient between the two coils.

4. Suppose length of a resistor is reduced to half. What will be the resistivity of new resistor ?



5. Compute the Laplace transform of $f(t) = t \sinh(10t)$.

6. A series LCR type band stop filter has $R = 1.5 \text{ k}\Omega$, $L = 140 \text{ mH}$ and $C = 300 \text{ pf}$, find the bandwidth.

7. A charged hollow sphere is suspended in a uniform electric field of E , then what will be the field strength inside the sphere?

8. The position of a point in cylindrical co-ordinate is specified by $(4, 2\pi/3, 3)$. What is the location of the point in spherical co-ordinates?



9. What are the main two factors which destroy the super conductivity ?

10. What happens when the temperature of a magnetic material is raised above the Curie point ?

11. In piezoelectric crystals, the electricity is generated by what mechanical action ?

12. Write the two disadvantages of controlling the speed of induction motor by changing rotor circuit resistance.



13. A 40 kVA transformer has core-loss of 450 W and full-load copper loss of 800 W. If the power factor of the load is 0.8, calculate the full load efficiency.

14. Why distributed windings and short pitch (chorded) windings are employed in AC machines ?

15. What is used to make the ceiling fan motor a self start ?

16. How the thermal efficiency of coal fired steam plant can be increased ?



17. What is an infinite bus in power system ?

18. What is meant by dynamic response in load frequency control ?

19. Define the Surge Impedance Loading (SIL) of a transmission line.

20. An overhead transmission line with surge impedance of 400 ohm is terminated through a resistance R . For what value of R the surge travelling over would not suffer any reflection ?

**PART – B**

Note : Answer **all** the following questions in **50** words each. Each question carries **5** marks.

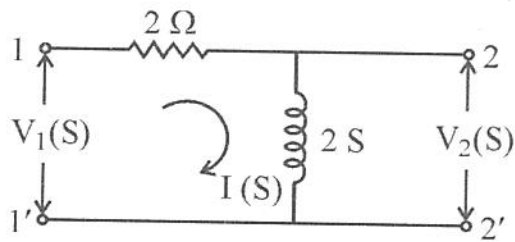
21. Enumerate the difference between transient response and steady state response of a circuit.

22. Calculate the range of K for which the system given by following characteristic equation is stable,

$$S^3 + 7S^2 + 10S + 10K = 0$$



23. For the network shown in figure, obtain the transfer functions $G_{21}(s)$ and $Z_{21}(s)$ and the driving point impedance $Z_{11}(s)$.



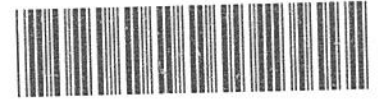


24. Given a vector function $E = a_x y + a_y x$ evaluate the line integral $\int E \cdot dl$ from $P_1(2, 1, -1)$ to $P_2(8, 2, -1)$; along the parabola $x = 2y^2$.

25. For aluminium conductor the conductivity is $\sigma = 3.82 \times 10^7$ S/m and the mobility of electrons $\mu_e = 0.0014$ m²/V-second. If the drift velocity is 5.3×10^{-4} m/second, find the current density and electric field intensity.



26. A pure silicon bar of 1 cm length, and 1 mm^2 cross-section area at room temp. of 27°C has intrinsic carries concentration equal to $1.5 \times 10^{16}/\text{m}^3$. The electron and proton mobility is $0.13 \text{ m}^2/\text{V}\text{-second}$ and $0.05 \text{ m}^2/\text{V}\text{-second}$ respectively. Find the conductivity of the silicon material.



27. Enumerate the various tests conducted on a transformer and purpose of these tests.

28. A single circuit 3- ϕ , 50 Hz transmission line consists of 3-conductors arranged in triangular fashion. The GMR and GMD of the lines are 0.002473 m and 5.848 m respectively. Find the inductance per kilometre of the line.



31. State why P-F and Q-V control loops can be treated as independent (non-interactive) in load frequency control.

32. Why circuit breaker SF_6 (Sulphur Hexa Fluoride) is widely used ?



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34. Discuss the Maxwell's equation in integral form.

An area of 0.75 m^2 in the $Z = 0$ plane is enclosed by a filamentary conductor. If the magnetic field B is given as $B = 0.05 \cos\left(\frac{10^3 t \bar{a}_y + \bar{a}_z}{\sqrt{2}}\right)$ tesla, determine the induced voltage.



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35. Draw the symmetrical wave form for the armature short circuit current for a 3- ϕ synchronous generator. Indicate the three periods into which its envelope may be divided.

A 3300/230 V, 50 kVA transformer is found to have impedance of 4% and copper loss of 1.8% at full load. Find its percentage reactance and also the Ohmic values of resistance, reactance and impedance as referred to primary. What would be the value of primary short circuit current, if primary voltage is assumed constant ?



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36. Under the study of single area system, find out the steady state change in frequency using final value theorem.

A 125 MVA turbo-alternator operates on full load at 50 Hz. A load of 50 MW is suddenly reduced on the machine. The steam valves to the turbine commence to close after 0.5 s due to the time lag in the governor system. Assuming the inertia to be constant. $H = 6$ kW-S per kVA of generator capacity, calculate the change in frequency that occurs in this time.



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A large rectangular area containing 20 horizontal lines, intended for writing or drawing.



- (b) Find the ABCD constants of a π circuit having a 600 ohm resistor for the shunt branch at the sending end, a one kilo ohm resistor for the shunt branch at the receiving end and an 80 ohm resistor for the series branch.



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04

30



SPACE FOR ROUGH WORK

