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To reach heights one must start climbing and if the journey is difficult then perseverance is the key to success. As a teacher we have realized over past years that success in any competitive exam requires hard work and proper guidance. **Engineers Academy** with its unique teaching methodologies has always proved that we meet the expectations of thousands of students and parents to make their dreams come true. With changing patterns, we have adapted ourselves to deliver the best and ensure better results.

This book has been organized and executed with a lot of care, dedication and passion for lucidity. A conscious attempt has been made to simplify the concepts to facilitate better understanding of the subject.

Engineers Academy has many successful stories of students who secured All India Rank in ESE, GATE, PSUs and JEn. Now we invite you to become a part of Engineers Academy to explore and achieve ultimate goal of your life. We promise to provide you quality guidance with competitive environment which is far advanced and ahead than the reach of other institution.

We would feel satisfied if the book meets the needs of the students for whom it is meant.

Lastly, we are thankful to all the engineers, authors whose work has been the source of enlightenment, inspiration and guidance in presenting this book.

It is hoped that the book in its new form will enjoy its ever increasing popularity.

Regards

Dr. Pankaj Goyal





# Preface

This book has been written to meet the growing requirements of candidates appearing for State Engineering Service Examination & Junior Engineer Exams. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in State Engineering Service Examination, Junior Engineer, Public Sector Units, RRB-JE and Metro Exams.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor typos in the book. If any such typos found, they will be highly appreciated and in corporated in the next edition. Also, please provide your valuable suggestions at :[engineers.academy.india@gmail.com](mailto:engineers.academy.india@gmail.com)

Wish you all the best. Have a nice reading.

**Team of**  
**Engineers Academy Publications**

**Summary of All Electrical Engineering  
Question Paper of Rajasthan State**

S. No.	Examination Name	Year	No. of Total MCQs	No. of Non-Tech MCQs	No. of Tech MCQs	Electrical Engineering (B.Tech/BE/Diploma) eligible
<b>Volume - I</b>						
1	RSEB JEn	2011	125	25	100	Degree
2	RPSC, Lecturer Tech. Edu.	2011	100	0	100	Degree
3	RPSC, Asst. Ele. Inspector	2011	100	0	100	Degree
4	RPSC, Vice Principal/Sup. ITI	2012	100	0	100	Degree + Experience
5	RPSC, AEn (Pre)	2013	100	0	100	Degree
6	RPSC, Lecturer Tech. Edu.	2014	100	0	100	Degree
7	Rajasthan PHED JEn	2015	100	40	60	Degree / Dillpoma
8	Rajasthan Nagar Palika AEn -Shift-I	2016	120	36	84	Degree
9	Rajasthan Nagar Palika AEn -Shift-II	2016	120	36	84	Degree
10	Rajasthan Nagar Palika AEn -Shift-III	2016	120	36	84	Degree
11	RPSC, AEn (Pre)	2018	100	0	100	Degree
12	RPSC, Vice Principal/Sup. ITI	2018	100	0	100	Degree + Experience
13	RPSC, ACF & Forest Range Officer	2018	120	0	120	Degree
14	RSEB JEn - (JVNL)	2018	140	80	60	Degree
15	RSEB JEn - (JDVNL)	2018	140	80	60	Degree
16	RSEB AEn - (RVUNL)	2018	140	80	60	Degree
17	Junior Instructor (Electrician)	2019	150	50	100	Degree / Diploma / ITI + Experience+ CITS
<b>Volume - II</b>						
18	Junior Instructor (Wiremen)	2019	150	50	100	Degree / Diploma / ITI + Experience+ CITS
19	RSMSSB (RSSB) JEn (Degree)	2020	120	40	80	Degree
20	RSMSSB (RSSB) JEn (Diploma)	2020	120	40	80	Diploma
21	RSMSSB (RSSB) JEn PHED(Degree)	2020	120	40	80	Degree
22	RSMSSB (RSSB) JEn PHED (Diploma)	2020	120	40	80	Diploma
23	RPSC, Lecturer Tech. Edu. (Paper -I)	2020	150	0	150	Degree
24	RPSC, Lecturer Tech. Edu. (Paper -II)	2020	150	0	150	Degree
25	RSEB JEn Shift - I	2021	140	80	60	Degree
26	RSEB JEn Shift - II	2021	140	80	60	Degree
27	RSEB AEn	2021	140	80	60	Degree
28	RIICO JEn	2021	150	60	90	Degree
29	JMRC JEn	2021	100	50	50	Degree
30	RSMSSB (RSSB) JEn (Degree)	2022	120	40	80	Degree
31	RSMSSB (RSSB) JEn (Diploma)	2022	120	40	80	Diploma
32	RSMSSB (RSSB) JEn PHED(Degree)	2022	120	40	80	Degree
33	RSMSSB (RSSB) JEn PHED (Diploma)	2022	120	40	80	Diploma
34	Junior Instructor (Electrician)	2024	120	40	80	Degree / Diploma / ITI + Experience + CITS
<b>Total</b>			<b>4175</b>	<b>1223</b>	<b>2952</b>	-

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## Rajasthan State Electricity Board (RSEB) JEn -2011

Exam Held In - 28.08.2011

PAPER

1

## OBJECTIVE QUESTIONS

1. A cable is 300 km long and has a conductor of 0.50 cm diameter with an insulation covering of 0.40 cm thickness. What is the capacitance of the cable if relative permittivity is 4.5?
- (a) 82  $\mu\text{F}$  (b) 78  $\mu\text{F}$   
(c) 76  $\mu\text{F}$  (d) 780  $\mu\text{F}$
- [RSEB JE - 2011]
2. A cutting tool exerts a tangential force of 400N on a steel bar of diameter 10 cm which is turned in a simple lathe. The lathe is driven by a chain at 840 rpm from a 220V d.c. motor which runs at 1800 rpm. Calculate the current drawn by the motor if its efficiency is 80%. What size is the motor pulley if the lathe pulley has a diameter of 24 cm?
- (a) 8.6 A & 11.4 cm  
(b) 18 A & 11.2 cm  
(c) 10 A & 11.2 cm  
(d) 11.2 A & 10 cm
- [RSEB JE - 2011]
3. A resistor of 200 ohm and a capacitor of 15  $\mu\text{F}$  are connected in series to a 220 V, 50 Hz AC source. What would be the current in the circuit?
- (a) 1.55 A (b) 0.55 A  
(c) 0.71 A (d) 0.755 A
- [RSEB JE - 2011]
4. A DC series motor takes 40A at 220V and runs at 800 rpm. If the armature and field resistance are 0.20 ohm & 0.10 ohm respectively and iron and friction losses are 0.50 kW, what is the torque developed in the armature and output of the motor?
- (a) 98.4 N-m & 8.8 kW  
(b) 99.3 N-m & 7.82 kW  
(c) 102.2 N-m & 7.82 kW  
(d) 96.1 N-m & 7.82 kW
- [RSEB JE - 2011]
1. एक केबल 300 किमी लंबी है और इसमें 0.50 सेमी व्यास का चालक है, जिस पर 0.40 सेमी मोटाई का इन्सुलेशन आवरण है। यदि सापेक्ष विद्युत्शीलता 4.5 है, तो केबल की धारिता क्या है?
- (a) 82  $\mu\text{F}$  (b) 78  $\mu\text{F}$   
(c) 76  $\mu\text{F}$  (d) 780  $\mu\text{F}$
- [RSEB JE - 2011]
2. एक काटने वाला उपकरण 10 सेमी व्यास वाली स्टील की छत पर 400 N का स्पर्शीय बल लगाता है जिसे एक साधारण खराद में घुमाया जाता है। खराद को 200 V d.c. मोटर से 840 rpm पर एक चैन द्वारा चलाया जाता है जो 1800 rpm पर चलती है। यदि मोटर की दक्षता 80% है तो मोटर द्वारा ली गई धारा की गणना करें। यदि खराद की चरखी का व्यास 24 सेमी है तो मोटर की चरखी का आकार क्या है ?
- (a) 8.6 A & 11.4 cm  
(b) 18 A & 11.2 cm  
(c) 10 A & 11.2 cm  
(d) 11.2 A & 10 cm
- [RSEB JE - 2011]
3. 200 ओम का एक प्रतिरोधक और 15  $\mu\text{F}$  का एक संधारित्र 220 V, 50 Hz AC स्रोत से श्रेणीक्रम में जुड़े हैं। परिपथ में धारा क्या होगी ?
- (a) 1.55 A (b) 0.55 A  
(c) 0.71 A (d) 0.755 A
- [RSEB JE - 2011]
4. एक डी.सी. सीरीज मोटर 220 V पर 40 A लेती है और 800 rpm पर चलती है। यदि आर्मेचर और क्षेत्र प्रतिरोध क्रमशः 0.20 ओम और 0.10 ओम है और लौह और घर्षण हानियाँ 0.50 kW हैं, तो आर्मेचर और मोटर के आउटपुट में विकसित बलाघूर्ण क्या है ?
- (a) 98.4 N-m & 8.8 kW  
(b) 99.3 N-m & 7.82 kW  
(c) 102.2 N-m & 7.82 kW  
(d) 96.1 N-m & 7.82 kW
- [RSEB JE - 2011]

5. The Fourier transform of a signal is given by  $h(\omega)$  is  $H(j\omega) = (2\cos\omega)(\sin 2\omega)/\omega$ . What would be the value of  $h(0)$  is.
- (a) 1/4 (b) 1/2  
(c) 1 (d) 2
- [RSEB JE - 2011]
6. A 3-phase transformer has its primary connected in  $\Delta$  and its secondary connected in Y. It has an equivalent resistance of 1% and equivalent reactance of 6%. The primary applied voltage is 6660V. What must be the ratio of transformation in order that it will deliver 4800V at full load current and 0.8 power factor (lag)?
- (a) 0.414 (b) 0.437  
(c) 0.528 (d) 0.420
- [RSEB JE - 2011]
7. A moving-iron voltmeter has an inductance of 0.70 H works for 50 Hz, has resistance of 3k ohm for a setting of 150 V. Find series resistance required to extend the range of the instrument to 300 V & d.c. voltage when the scale reading shows 200 V.
- (a) 3012 ohm & 200.134 V  
(b) 3015 ohm & 199.40 V  
(c) 3006 ohm & 201.4 V  
(d) 6024 ohm & 200.2 V
- [RSEB JE - 2011]
8. An 8-pole, 50Hz, 3-phase slip ring induction motor has effective rotor resistance of 0.08 ohm/phase starting speed is 650 rpm. How much resistance in ohm/phase must be inserted in the rotor phase to obtain the maximum torque at starting? Ignore magnetizing current and stator leakage impedance.
- (a) 0.50 (b) 0.61  
(c) 5.2 (d) 0.52
- [RSEB JE - 2011]
9. For a 3-phase slip-ring induction motor the maximum torque is 2.5 times the full-load torque and the starting torque is 1.5 times the full-load torque. Determine percentage reduction in rotor circuit resistance to get a full load slip of 3%. Neglect stator impedance.
- (a) 58.6% (b) 56.8%  
(c) 54.2% (d) 66.8%
- [RSEB JE - 2011]
10. An analog voltmeter uses external multiplier settings with a multiplier setting of 20 k $\Omega$ . It reads 440 V and with a multiplier setting of 80 k $\Omega$ . It reads 352 V. What will be the voltmeter reading for a multiplier setting of 40 k $\Omega$ ?
- (a) 300V (b) 250V  
(c) 225V (d) 412V
- [RSEB JE - 2011]
5. किसी सिग्नल का फूरियर रूपांतरण  $h(\omega)$  है  $H(j\omega) = (2\cos\omega)(\sin 2\omega)/\omega$ .  $h(0)$  का मान क्या होगा?
- (a) 1/4 (b) 1/2  
(c) 1 (d) 2
- [RSEB JE - 2011]
6. एक 3-फेज ट्रांसफार्मर का प्राथमिक  $\Delta$  और द्वितीयक Y से जुड़ा है इसका समतुल्य प्रतिरोधक 1% और समतुल्य प्रतिकारक 6% है। प्राथमिक लागू वोल्टेज 6660V है। पूर्ण भार धारा और 0.8 शक्ति गुणांक (पश्च) पर 4800 V प्रदान करने के लिए परिवर्तन का अनुपात क्या होना चाहिए ?
- (a) 0.414 (b) 0.437  
(c) 0.528 (d) 0.420
- [RSEB JE - 2011]
7. एक चल-लौह वोल्टमीटर का प्रेरकत्व 0.70 H है जो 50 Hz पर काम करता है, 150 V की सेटिंग के लिए इसका प्रतिरोध 3 k ohm है। जब स्केल रीडिंग 200 V दिखाती है तो उपकरण की सीमा को 300 V और d.c. वोल्टेज तक बढ़ाने के लिए आवश्यक श्रृंखला प्रतिरोध ज्ञात करें।
- (a) 3012 ohm & 200.134 V  
(b) 3015 ohm & 199.40 V  
(c) 3006 ohm & 201.4 V  
(d) 6024 ohm & 200.2 V
- [RSEB JE - 2011]
8. एक 8-पोल, 50-हर्ट्ज, 3-फेज स्लिप रिंग प्रेरण मोटर का प्रभावी रोटर प्रतिरोध 0.08 ओम/फेज है, स्टार्टिंग स्पीड 650 आरपीएम है। स्टार्टिंग पर अधिकतम बलाघूर्ण प्राप्त करने के लिए रोटर फेज में ओम/फेज में कितना प्रतिरोध जोड़ा जाना चाहिए ? चुम्बकीय धारा और स्टेटर रिखाव प्रतिबाधा को नगण्य करें।
- (a) 0.50 (b) 0.61  
(c) 5.2 (d) 0.52
- [RSEB JE - 2011]
9. एक 3-फेज स्लिप-रिंग प्रेरण मोटर के लिए अधिकतम बलाघूर्ण पूर्ण भार बलाघूर्ण का 2.5 गुना है और शुरुआती बलाघूर्ण पूर्ण भार बलाघूर्ण का 1.5 गुना है। 3% की पूर्ण भार स्लिप प्राप्त करने के लिए रोटर परिस्थ प्रतिरोध में प्रतिशत कमी का निर्धारण करें। स्टेटर प्रतिबाधा को नगण्य करें।
- (a) 58.6% (b) 56.8%  
(c) 54.2% (d) 66.8%
- [RSEB JE - 2011]
10. एक एनालॉग वोल्टमीटर 20 k $\Omega$  की गुणक सेटिंग के साथ बहरी गुणक सेटिंग का उपयोग करता है। यह 440 पढ़ता है और 80 k $\Omega$  की गुणक सेटिंग के साथ यह 352 V पढ़ता है। 40 k $\Omega$  की गुणक सेटिंग के लिए वोल्टमीटर रीडिंग क्या होगी ?
- (a) 300V (b) 250V  
(c) 225V (d) 412V
- [RSEB JE - 2011]

11. A storage battery consists of 55 series connected cells each of internal resistance  $0.001 \text{ ohm}$  and emf  $2.1 \text{ V}$ . Each cell consists of 21 plates, 10 positive and 11 negative, each plate measuring  $20 \times 25 \text{ cm}$ . If full-load current per cell is  $0.01 \text{ A}$  per  $\text{cm}^2$  of positive plate surface. Find
- full-load terminal voltage of the battery and
  - power loss in the battery if the connectors have a total resistance of  $0.025 \text{ ohm}$
- (a)  $107.5 \text{ V}$  and  $800 \text{ W}$  (b)  $105.7 \text{ V}$  and  $800 \text{ W}$   
(c)  $102.5 \text{ V}$  and  $800 \text{ W}$  (d)  $106 \text{ V}$  and  $800 \text{ W}$
- [RSEB JE - 2011]
12. A pure inductor of  $25 \text{ mH}$  is connected to a source of  $220 \text{ V AC}$ . What would be the rms current in the circuit if the frequency of the source is  $50 \text{ Hz}$
- (a)  $24.02 \text{ A}$  (b)  $28.03 \text{ A}$   
(c)  $30.10 \text{ A}$  (d)  $26.3 \text{ A}$
- [RSEB JE - 2011]
13. In a RL circuit the AC source has a voltage of  $220 \text{ V}$  and the potential difference across the inductance is  $176 \text{ V}$ . What would be the potential difference across the resistance-
- (a)  $44 \text{ V}$  (b)  $396 \text{ V}$   
(c)  $132 \text{ V}$  (d)  $138 \text{ V}$
- [RSEB JE - 2011]
14. A coil has an inductance of  $53 \text{ mH}$  and a resistance of  $0.35 \text{ ohm}$ . How much energy is stored up in the magnetic field after the current has built up to its equilibrium value if an emf of  $12 \text{ V}$  is applied across?
- (a)  $25 \text{ J}$  (b)  $41 \text{ J}$   
(c)  $31 \text{ J}$  (d)  $33 \text{ J}$
- [RSEB JE - 2011]
15. Calculate the resonance frequency of a circuit consisting of an inductor of  $0.2 \text{ mH}$  and capacitor of  $2 \mu\text{F}$  capacitance.
- (a)  $7.45 \text{ kHz}$  (b)  $8.66 \text{ kHz}$   
(c)  $7.96 \text{ kHz}$  (d)  $10.34 \text{ kHz}$
- [RSEB JE - 2011]
16. What should be the order of pressure of gas in a discharge tube for production cathode rays in mm of mercury?
- (a)  $1/10 - 1/100$  (b)  $1/50 - 1/100$   
(c)  $1/100 - 1/1000$  (d)  $1 - 2$
- [RSEB JE - 2011]
17. What is the position of the input and output signals of CE amplifier?
- (a) always equal  
(b) always in phase  
(c)  $180 \text{ deg}$  out of phase  
(d)  $90 \text{ deg}$  out of phase
- [RSEB JE - 2011]
11. एक स्टोरेज बैटरी में 55 श्रृंखलाबद्ध सेल हैं, जिनमें से प्रत्येक का आंतरिक प्रतिरोध  $0.001 \text{ ohm}$  और ईएमएफ  $2.1 \text{ V}$  है। प्रत्येक सेल में 21 प्लेटें हैं, 10 धनात्मक और 11 ऋणात्मक, प्रत्येक प्लेट की माप  $20 \times 25 \text{ सेमी}$  है। यदि धनात्मक प्लेट सतह की प्रति सेल पूर्ण भार द्वारा  $0.01 \text{ A}$  प्रति  $\text{सेमी}^2$  है? ज्ञात कीजिए।
- बैटरी का पूर्ण भार टर्मिनल वोल्टेज और
  - बैटरी में शक्ति हानि ज्ञात करें यदि कनेक्टरों का कुल प्रतिरोध  $0.025 \text{ ohm}$  है ?
- (a)  $107.5 \text{ V}$  और  $800 \text{ W}$  (b)  $105.7 \text{ V}$  और  $800 \text{ W}$   
(c)  $102.5 \text{ V}$  और  $800 \text{ W}$  (d)  $106 \text{ V}$  और  $800 \text{ W}$
- [RSEB JE - 2011]
12.  $25 \text{ mH}$  का एक शुद्ध प्रेरक  $220 \text{ V AC}$  के स्रोत से जुड़ा है यदि स्रोत की आवृत्ति  $50 \text{ Hz}$  है तो परिपथ में rms धारा क्या होगी ?
- (a)  $24.02 \text{ A}$  (b)  $28.03 \text{ A}$   
(c)  $30.10 \text{ A}$  (d)  $26.3 \text{ A}$
- [RSEB JE - 2011]
13. RL परिपथ में AC स्रोत का वोल्टेज  $220 \text{ V}$  है तो प्रेरकत्व के पार विभवान्तर  $176 \text{ V}$  है प्रतिरोध के पार विभवान्तर क्या होगा ?
- (a)  $44 \text{ V}$  (b)  $396 \text{ V}$   
(c)  $132 \text{ V}$  (d)  $138 \text{ V}$
- [RSEB JE - 2011]
14. एक कुंडली का प्रेरकत्व  $53 \text{ mH}$  है तथा प्रतिरोध  $0.35 \text{ ओम}$  है। यदि कुंडली पर  $12 \text{ V}$  का विद्युत वाहक बल लगाया जाए तो धारा के स्तुलन मान तक पहुंचने के बाद चुंबकीय क्षेत्र में कितनी ऊर्जा संग्रहित होती है ?
- (a)  $25 \text{ J}$  (b)  $41 \text{ J}$   
(c)  $31 \text{ J}$  (d)  $33 \text{ J}$
- [RSEB JE - 2011]
15.  $0.02 \text{ mH}$  के प्रेरक तथा  $2 \mu\text{F}$  धारिता के संयोजन से बने परिपथ की अनुनाद आवृत्ति की गणना कीजिए।
- (a)  $7.45 \text{ kHz}$  (b)  $8.66 \text{ kHz}$   
(c)  $7.96 \text{ kHz}$  (d)  $10.34 \text{ kHz}$
- [RSEB JE - 2011]
16. कॅथोड किरणों के उत्पादन के लिए डिस्चार्ज ट्यूब में गैस के दबाव का क्रम पारे के मिलीमीटर में क्या होना चाहिए ?
- (a)  $1/10 - 1/100$  (b)  $1/50 - 1/100$   
(c)  $1/100 - 1/1000$  (d)  $1 - 2$
- [RSEB JE - 2011]
17. CE प्रवर्धक के इनपुट और आउटपुट सिग्नल की स्थिति क्या है ?
- (a) हमेशा बराबर  
(b) हमेशा फेज में  
(c)  $180 \text{ डिग्री}$  फेज से बाहर  
(d)  $90 \text{ डिग्री}$  फेज से बाहर
- [RSEB JE - 2011]

18. In Millikan's oil drop experiment if oil drop does not have vertical motion under application of voltage which of the followings does not influence voltage?  
 (a) radius of oil drop  
 (b) density of oil  
 (c) due to gravity  
 (d) light intensity  
 [RSEB JE - 2011]
19. A bulb is connected in series with a solenoid and glowing in an AC circuit. What happens to the brightness if a soft iron core is introduced inside the solenoid?  
 (a) Increases  
 (b) No changes  
 (c) Diminishes instantaneously  
 (d) Diminishes slowly to zero  
 [RSEB JE - 2011]
20. A charged particle is moving in a circular path in a magnetic field. If the velocity of the charged particle increase suddenly. Which of the following quantities would remain unaffected?  
 (a) Kinetic energy (b) Momentum  
 (c) Radius (d) Angular frequency  
 [RSEB JE - 2011]
21. A proton and an alpha particle having the same kinetic energy enter an uniform magnetic field at right angle to their velocity vector at start tracing circles of radii of  $R_1$  &  $R_2$ . What would be the relationship between  $R_1$  &  $R_2$ ?  
 (a) 2 : 1 (b) 1 : 2  
 (c) 1 : 1 (d) 4 : 1  
 [RSEB JE - 2011]
22. What will be the dynamic impedance of a RL and C Parallel circuit at resonance in ohm?  
 (a) C/LR (b) LC/R  
 (c) L/CR (d) E/LC  
 [RSEB JE - 2011]
23. A sine wave has frequency of 50 Hz its angular frequency is in radians second  
 (a)  $50\pi$  (b)  $360\pi$   
 (c)  $100\pi$  (d)  $180\pi$   
 [RSEB JE - 2011]
24. The rms value of a half wave rectified current is 10A. What would be the full wave rectification value in Amps?  
 (a) 7.07 (b) 20  
 (c) 14.14 (d)  $20\sqrt{2}$   
 [RSEB JE - 2011]
18. मिलिकन के तेल की बूद प्रयोग में यदि वोल्टेज के अनुप्रयोग में तेल की बूद में ऊर्ध्वाधर गति नहीं होती है, तो निम्न में से कौन सा वोल्टेज परिवर्तन नहीं करता है ?  
 (a) तेल की बूद की त्रिज्या  
 (b) तेल का घनत्व  
 (c) गुरुत्वाकर्षण के कारण  
 (d) प्रकाश तीव्रता  
 [RSEB JE - 2011]
19. एक बल्ब एक सोलेनोइड के साथ श्रृंखला में जुड़ा हुआ है और एक एसी परिपथ में चमक रहा है। यदि सोलेनोइड के अंदर नरम लोहे का कोर डाला जाता है तो चमक में क्या होता है ?  
 (a) बढ़ता है  
 (b) कोई परिवर्तन नहीं होता है  
 (c) तुरंत कम हो जाता है  
 (d) धीरे-धीरे शून्य तक कम हो जाता है  
 [RSEB JE - 2011]
20. एक आवेशित कण चुंबकीय क्षेत्र में वृत्ताकार पथ पर घूम रहा है यदि आवेशित कण का वेग अचानक बढ़ जाता है तो निम्नलिखित में से कौन सी राशि अप्रभावित रहेगी।  
 (a) गतिज ऊर्जा (b) संवेग  
 (c) त्रिज्या (d) कोणीय आवृत्ति  
 [RSEB JE - 2011]
21. समान गतिज ऊर्जा वाले एक प्रोटॉन और एक अल्फा कण  $R_1$  और  $R_2$  त्रिज्या के वृत्तों का पता लगाते हुए अपने वेग सदिश के समकोण पर एक समान चुंबकीय क्षेत्र में प्रवेश करते हैं,  $R_1$  और  $R_2$  के बीच क्या संबंध होगा ?  
 (a) 2 : 1 (b) 1 : 2  
 (c) 1 : 1 (d) 4 : 1  
 [RSEB JE - 2011]
22. ओम में अनुनाद पर RL और C समांतर परिपथ की गतिशील प्रतिबाधा क्या होगी ?  
 (a) C/LR (b) LC/R  
 (c) L/CR (d) E/LC  
 [RSEB JE - 2011]
23. एक ज्या तरंग की आवृत्ति 50 हर्ट्ज है, इसकी कोणीय आवृत्ति रेडियन सेकंड में... है  
 (a)  $50\pi$  (b)  $360\pi$   
 (c)  $100\pi$  (d)  $180\pi$   
 [RSEB JE - 2011]
24. अर्ध तरंग दिष्टकृत धारा का rms मान 10A है। एम्पियर में पूर्ण तरंग दिष्टकरण मान क्या होगा ?  
 (a) 7.07 (b) 20  
 (c) 14.14 (d)  $20\sqrt{2}$   
 [RSEB JE - 2011]

25. An alternating current is defined as  $i = 14.14 \sin \left( \omega t + \frac{\pi}{6} \right)$ . What would be its rms value in amps?
- (a) 7.07 (b) 14.14  
(c) 10 (d) 0.707
- [RSEB JE - 2011]
26. Which of the following is the basis of Norton's theorem?
- (a) An equivalent current source  
(b) An equivalent source of emf  
(c) An equivalent power source  
(d) An equivalent resistance
- [RSEB JE - 2011]
27. What happens when the frequency of the voltage applied across a capacitor increases?
- (a) Current increases  
(b) Current remains unchanged  
(c) Current decreases  
(d) Voltage is maximum
- [RSEB JE - 2011]
28. What is the mechanical energy source used to drive a dc generator?
- (a) alternator (b) armature  
(c) motor drive (d) prime mover
- [RSEB JE - 2011]
29. Which of the following status of power factor makes the terminal voltage of an alternator increase with load?
- (a) unity (b) lagging  
(c) less than unity (d) leading
- [RSEB JE - 2011]
30. What is the number of poles if generator when driven at 375 rpm, generates emf at 50Hz frequency?
- (a) 4 (b) 8  
(c) 12 (d) 16
- [RSEB JE - 2011]
31. Which of the following is known as power lost as heat in the armature and field windings of a dc machine?
- (a) Hysteresis loss  
(b) Mechanical loss  
(c) Eddy current loss  
(d) Copper loss
- [RSEB JE - 2011]
25. प्रत्यावर्ती धारा को  $i = 14.14 \sin \left( \omega t + \frac{\pi}{6} \right)$  के रूप में परिभाषित किया गया है। इसका rms मान एम्पीयर में क्या होगा?
- (a) 7.07 (b) 14.14  
(c) 10 (d) 0.707
- [RSEB JE - 2011]
26. निम्नलिखित में से कौन नॉर्टन प्रमेय का आधार है
- (a) एक समतुल्य धारा स्रोत  
(b) एक समतुल्य ईएमएफ स्रोत  
(c) एक समतुल्य शक्ति स्रोत  
(d) एक समतुल्य प्रतिरोध
- [RSEB JE - 2011]
27. क्या होता है जब किसी संधारित्र पर लगाए गए वोल्टेज की आवृत्ति बढ़ जाती है ?
- (a) धारा बढ़ जाती है  
(b) धारा अपरिवर्तित रहती है  
(c) धारा घट जाती है  
(d) वोल्टेज अधिकतम है
- [RSEB JE - 2011]
28. डीसी जनरेटर को चलाने के लिए उपयोग किया जाने वाला यांत्रिक ऊर्जा स्रोत क्या है ?
- (a) अल्टरनेटर (b) आर्मेचर  
(c) मोटर ड्राइव (d) प्राइम मूवर
- [RSEB JE - 2011]
29. शक्ति गुणांक की निम्नलिखित में से कौन सी स्थिति अल्टरनेटर के टर्मिनल वोल्टेज को भार के साथ बढ़ती है ?
- (a) यूनिटी (b) लैगिंग  
(c) यूनिटी से कम (d) लीडिंग
- [RSEB JE - 2011]
30. यदि जनरेटर को 375 आरपीएम पर चलाने पर 50 हर्ट्ज आवृत्ति पर ईएमएफ उत्पन्न होता है, तो ध्रुवों की संख्या क्या है ?
- (a) 4 (b) 8  
(c) 12 (d) 16
- [RSEB JE - 2011]
31. निम्नलिखित में से किस डीसी मशीन के आर्मेचर और फील्ड वइंडिंग में ऊष्मा के रूप में खोई गई शक्ति के रूप में जाना जाता है ?
- (a) हॉथिल्य हानि  
(b) यांत्रिक हानि  
(c) भ्रष्ट वात हानि  
(d) ताप हानि
- [RSEB JE - 2011]

32. What is the equivalent start value when three resistances, each  $R$  Ohm, are connected in delta?  
 (a)  $R$  (b)  $R/3$   
 (c)  $3R$  (d)  $4R$   
**[RSEB JE - 2011]**
33. What will be mutual inductance between two coils, X of 1000 turns and Y of 2000 turns placed such that 60% of the flux produced by coil x links coil y current of 1 A in coil x produces 0.1 mWb flux?  
 (a) 0.08 H (b) 0.06 H  
 (c) 0.4 H (d) 0.12 H  
**[RSEB JE - 2011]**
34. The full-load voltage regulation of an alternator is 6% at 0.8 p.f. lagging and at rated speed of 1200 r.p.m. What would be the fullload voltage regulation at 0.8 p.f. lagging and at 1100 rpm?  
 (a) less than 6% (b) more than 6%  
 (c) 5.5% (d) 6%  
**[RSEB JE - 2011]**
35. Which of the following is determined when the open-circuit test on a transformer is conducted?  
 (a) core losses  
 (b) the ohmic loss  
 (c) the leakage impedance  
 (d) hysteresis loss only  
**[RSEB JE - 2011]**
36. Which of the following is reduced by using fractional-pitch winding?  
 (a) amount of copper in the winding  
 (b) size of the machine  
 (c) power of the machine  
 (d) harmonics in the generated emf  
**[RSEB JE - 2011]**
37. When the load on the rotor shaft of synchronous motor gradually increases, then which one of the following quantities must increase?  
 (a) Power factor angle  
 (b) Current and the torque angle  
 (c) Current and power factor angle  
 (d) Current angle  
**[RSEB JE - 2011]**
38. A transformer can have zero voltage regulation at  
 (a) Leading power factor  
 (b) Lagging power factor  
 (c) Unity power factor  
 (d) Zero power factor  
**[RSEB JE - 2011]**
32. जब तीन प्रतिरोध, प्रत्येक  $R$  ओम, डेल्टा में जुड़े होते हैं, तो समतुल्य स्टार मान क्या होता है ?  
 (a)  $R$  (b)  $R/3$   
 (c)  $3R$  (d)  $4R$   
**[RSEB JE - 2011]**
33. दो कुंडलियों X जिसमें 1000 फेरे हैं तथा Y जिसमें 2000 फेरे हैं, के बीच पारस्परिक प्रेरकत्व क्या होगा, यदि कुंडल x द्वारा उत्पादित फ्लक्स का 60% कुंडल y से जुड़ता है, कुंडल x में 1A धारा 0.1 mWb फ्लक्स उत्पन्न करती है ?  
 (a) 0.08 H (b) 0.06 H  
 (c) 0.4 H (d) 0.12 H  
**[RSEB JE - 2011]**
34. अल्टरनेटर का पूर्ण भार वोल्टेज विनियमन 0.8 पी.एफ. परवर्गामी पर और 1200 आर.पी.एम. की निर्धारित गति पर 6% है। 0.8 पी. एफ. परवर्गामी और 1100 आर.पी.एम. पर पूर्ण भार वोल्टेज विनियमन क्या होगा ?  
 (a) 6% से कम (b) 6% से ज्यादा  
 (c) 5.5% (d) 6%  
**[RSEB JE - 2011]**
35. निम्नलिखित में से क्या खुला परिपथ संचालित होने पर निर्धारित किया जाता है ?  
 (a) कोर हानि  
 (b) ओमिक हानि  
 (c) रिसाव प्रतिबाधा  
 (d) केवल शैथिल्य हानि  
**[RSEB JE - 2011]**
36. फ्रैक्चोरिय-पिच वाइंडिंग का उपयोग करके निम्नलिखित में से किसे कम किया जाता है  
 (a) कुण्डली में तबिये की मात्रा  
 (b) मशीन का आकार  
 (c) मशीन की शक्ति  
 (d) इन्पुट में उत्पादित हार्मोनिक  
**[RSEB JE - 2011]**
37. जब तुल्यकालिक मोटर के रोटर शाफ्ट पर भार धीरे-धीरे बढ़ता है, तो निम्नलिखित में से कौन सी राशि बढ़नी चाहिए ?  
 (a) शक्ति गुणांक कोण  
 (b) धारा और बलाघूर्ण कोण  
 (c) धारा और शक्ति गुणांक कोण  
 (d) बलाघूर्ण कोण  
**[RSEB JE - 2011]**
38. एक ट्रांसफार्मर में शून्य वोल्टेज विनियमन हो सकता है—  
 (a) अग्रवर्गीय शक्ति कारक  
 (b) परवर्गामी शक्ति कारक  
 (c) एकता शक्ति कारक  
 (d) शून्य शक्ति कारक  
**[RSEB JE - 2011]**

## ANSWERS KEY

1. **Ans. (b)**

Given that,

$$a = 0.5/2 = 0.25 \text{ cm}$$

$$b = 0.25 + 0.4 = 0.65 \text{ cm}$$

The capacitance of a cable is

$$C = \frac{0.024\epsilon_0}{\log\left(\frac{b}{a}\right)} \mu\text{F/km}$$

$$C = \frac{0.024 \times 4.5}{\log\left(\frac{0.65}{0.25}\right)} = \frac{0.108}{0.415} = 0.26$$

Total capacitance for 300 km is

$$= 300 \times 0.26$$

$$= 78 \mu\text{F}$$

2. **Ans. (c)**

Given

Motor efficiency = 80%

Motor speed = 840 rpm

Torque  $T_{sh}$  = Tangential force  $\times$  radius

$$= 400 \times 0.05 = 20 \text{ N-m}$$

Output power =  $T_{sh} \times 2\pi N$  Watt

$$= 20 \times 2\pi \left(\frac{840}{60}\right) \text{ W}$$

$$= 1760 \text{ W}$$

When motor efficiency = 80%

$$\text{So, Motor input} = \frac{1760}{0.8} = 10A$$

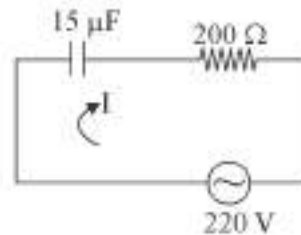
Let  $N_1$  and  $D_1$  be the speed and diameter of the driven pulley respectively and  $N_2$  and  $D_2$  the respective speed and diameter of the lathe pulley.

Then,

$$N_1 \times D_1 = N_2 \times D_2$$

$$D_2 = \frac{N_1 \times D_1}{N_2}$$

$$= \frac{840 \times 24}{1800} = 11.2 \text{ cm}$$



For RC series circuit:

$$X_c = \frac{1}{2\pi fC}$$

$$= \frac{1}{2 \times 50 \times 15 \times 10^{-6}}$$

$$= 212.20 \text{ ohm}$$

The impedance of RC circuit

$$Z = \sqrt{R^2 + X_c^2}$$

$$= \sqrt{(200)^2 + (212.20)^2}$$

$$= 291.60 \text{ ohm}$$

Current in RC series circuit:

$$I = \frac{V}{Z} = \frac{220}{291.60}$$

$$= 0.755 \text{ A}$$

4. **Ans. (b)**

Given

$$V = 220 \text{ V}, I_a = 40 \text{ A}, N = 800 \text{ rpm}$$

$$R_a = 0.20 \text{ ohm}, R_w = 0.10 \text{ ohm}$$

Back emf equation of DC motor

$$E_b = V - I_a(R_a + R_w)$$

$$= 220 - 40(0.20 + 0.10)$$

$$= 208 \text{ V}$$

Torque developed by the motor

$$T_a = \frac{9.55 \times E_b I_a}{N} \text{ N-m}$$

$$= \frac{9.55 \times 208 \times 40}{800} = 99.32 \text{ N-m}$$

Total input power in the motor

$$P_{in} = E_b I_a = 208 \times 40$$

$$= 8320 \text{ W} = 8.32 \text{ kW}$$

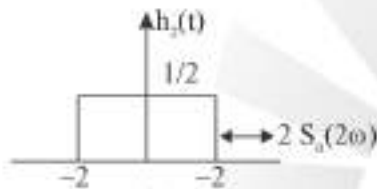
Total output power ( $P_r$ )  
 = Air gap power ( $P_g$ ) – friction and windage losses  
 = 8.32 – 0.50  
 = 7.82 kW

5. **Ans. (c)**

Given

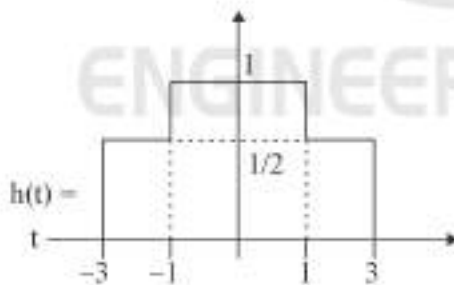
$$H(j\omega) = \frac{2\cos\omega \sin 2\omega}{\omega} \quad \dots(i)$$

$$\begin{aligned} H(j\omega) &= 2\cos\omega \frac{2\sin 2\omega}{2\omega} \\ &= H_1(j\omega)H_2(j\omega) \quad \dots(ii) \end{aligned}$$

Where  $H_1(j\omega) = \frac{2\sin 2\omega}{2\omega} = 2S_1(2\omega)$ 

$$\begin{aligned} H_1(j\omega) &= 2\cos\omega = (e^{j\omega} + e^{-j\omega}) \\ &= e^{j\omega} + e^{-j\omega(-1)} \end{aligned}$$

So,  $H_1(j\omega) = 2\cos\omega + H_2(j\omega)$   
 $= (e^{j\omega} + e^{-j\omega})H_2(j\omega)$   
 $= e^{j\omega}H_2(j\omega) + e^{-j\omega}H_2(j\omega)$   
 $h(t) = h_1(t+1) + h_1(t-1)$

So,  $h(0) = 1$ 6. **Ans. (b)**Given  $\text{pf} = 0.8$  lagging

Primary voltage = 6600 V

We know that,

$$\text{VR}\% = R\% \cos\phi + X\% \sin\phi$$

$$= 1 \times 0.8 + 6 \times 0.6$$

$$\text{VR}\% = 4.4\%$$

Induced secondary emf (line value)

$$= 4800 + 4.4\% \text{ of } 4800$$

$$V_L = 5011.2 \text{ V}$$

Secondary phase voltage

$$V_{\phi} = \frac{V_L}{\sqrt{3}} = \frac{5011.2}{\sqrt{3}} = 2893.2 \text{ V}$$

Transformation ratio:

$$K = \frac{2893.2}{6600} = 0.437$$

7. **Ans. (a)**Given,  $V = 150 \text{ V}$ ,

Meter Inductance = 0.7 H

Resistance = 3 k $\Omega$ Voltmeter Reactance =  $2\pi \times 50 \times 0.7$ 

$$= 220 \Omega$$

Impedance of voltmeter =  $3000 + j220$ 

$$Z = 3008 \Omega$$

When the voltmeter range is doubled, its impedance has also to be doubled in order to have the same current for full scale deflection. If  $R$  is the required series resistance, then

$$(3000 + R)^2 + 220^2 = (2 \times 3008)^2$$

$$R = 3012 \text{ ohm}$$

When used on D.C. supply, if the voltmeter reads 200V, the actual applied dc voltage would be

$$= 200(\text{Total impedance/Total DC resistance})$$

$$= 200(2 \times 3008) / (3000 + 3012)$$

$$V_{DC} = 200.134 \text{ V}$$

8. **Ans. (d)**

Given,

$$R_{\text{motor}} = 0.08 \text{ ohm/phase}$$

Starting speed = 650 rpm

$$N_s = \frac{120 \times f}{P} = \frac{120 \times 50}{8} = 750 \text{ rpm}$$

Slip of the motor



$$\text{Slip} = \frac{N_s - N_r}{N_s} = \frac{100}{750} = 0.133$$

Resistance required to extend rotor phase

$$\text{Slip} = \frac{R_2}{R_2 + r}$$

$$0.133 = \frac{0.08}{0.08 + r}$$

$$r = 0.52 \text{ ohm/phase}$$

9. **Ans. (b)**

Given,  $T_{\max} = 2.5 T_0$ ,  $T_0 = 1.5 T_0$

Hence,  $\frac{T_e}{T_0} = \frac{1.5}{2.5} = \frac{3}{5}$

Now,  $\frac{T_e}{T_0} = \frac{3}{5} = \frac{2a}{1+a^2}$

$$= 3a^2 - 10a + 3 = 0 \Rightarrow a = \frac{1}{3}$$

$$a = \frac{R_2}{X_2} \text{ or } R_2 = \frac{X_2}{3}$$

When full load slip is 0.03

$$\frac{T_e}{T_0} = \frac{2as}{a^2 + s^2} \text{ or } \frac{2}{2.5}$$

$$= \frac{2a \times 0.03}{a^2 + (0.03)^2}$$

$$a^2 - 0.15a - 10.09 = 0$$

$$a = 0.1437$$

If  $R_1$  is the new rotor circuit resistance, then 0.1437

$$= R_1/X_2 \text{ or } R_1 = 0.1437 X_2$$

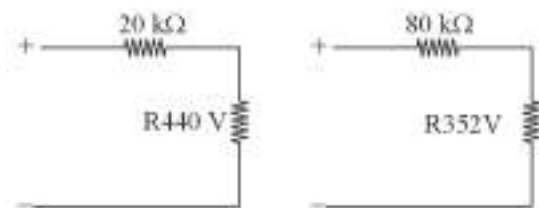
Percentage reduction in rotor resistance is

$$= \frac{(X_2/3) - 0.1437X_2}{(X_2/3)} \times 100 = 56.8\%$$

10. **Ans. (d)**

Let resistance of voltmeter be  $R_k \Omega$  ohm. When,

$$R_{v1} = 20 \text{ k}\Omega, V = 440 \text{ V}$$



From the figure

$$V = \left( \frac{440}{R_m} \right) \times 20 + 440 \quad \dots(i)$$

When  $R_{v2} = 80 \text{ k}\Omega, V = 352 \text{ V}$

$$V = 352 + (352/R_{v2}) \times 80 \quad \dots(ii)$$

Solving equation (i) and (ii)

We get:

$$V = 480 \text{ V}, \quad R = 220 \Omega$$

When  $R_{v3} = 40 \text{ k}\Omega, \quad V = 480 \text{ V}$

$$V_L = \frac{480}{40 + 220} \times 220$$

$$= 406.15 \text{ V} = 412 \text{ V}$$

11. **Ans. (a)**

Given,

Resistance of each cell =  $0.001 \Omega$

Plate area =  $20 \times 25 \text{ cm}^2$

e.m.f. each cell = 2.1 V

Total cell = 55

Current per cell =  $0.01 \text{ A/cm}^2$

Total area of both side ten positive plates

$$= 2 \times 20 \times 25 \times 10$$

$$= 10000 \text{ cm}^2$$

Full load current = area  $\times$  current

$$= 10000 \times 0.01$$

$$= 100 \text{ A}$$

Total resistance =  $55 \times r$

$$= 55 \times 0.01$$

$$= 0.55$$

Voltage drop in battery =  $100(r+R)$

$$= 100(0.55 + 0.025)$$

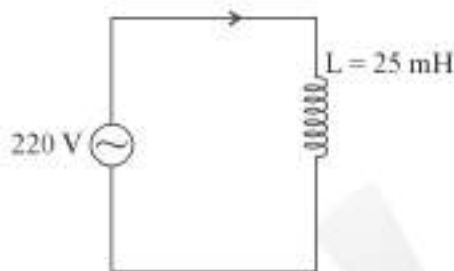
$$= 8 \text{ V}$$

emf of battery =  $55 \times 2.1 = 115.5 \text{ V}$

(i) Battery terminal voltage on full load  
 $= 115.5 - 8V = 107.5 V$

(ii) Total resistance  $= 55 \times 0.001 + 0.025$   
 $= 0.08 \Omega$   
 Power loss  $= IR^2$   
 $= (100)^2 \times 0.08 = 800 W$

12. **Ans. (b)**



Given that,  $L = 25 \text{ mH}$ ,  $V = 220 \text{ V}$ ,  $F = 50 \text{ Hz}$

For pure inductor circuit

$$Z = X_L$$

$$X_L = 2\pi fL$$

$$= 2\pi \times 50 \times 25 \times 10^{-3}$$

$$= 7.85 \text{ ohm}$$

Hence, rms current in the circuit

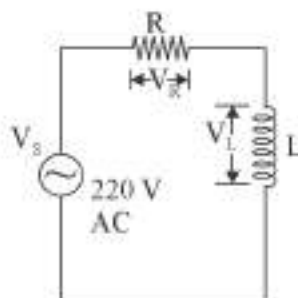
$$I = \frac{V}{Z} = \frac{V}{X_L}$$

$$= \frac{220}{7.85} = 28.025$$

$$= 28.03 \text{ A}$$

13. **Ans. (c)**

Given that,  $V_s = 220 \text{ VAC}$



Therefore, we know that,

In RL circuit

$$V_s^2 = V_R^2 + V_L^2$$

$$V_R^2 = V_s^2 - V_L^2$$

$$= (220)^2 - (176)^2$$

$$= 48400 - 30976$$

$$V_R^2 = 17424$$

$$V_R = 132 \text{ V}$$

14. **Ans. (c)**

Given  $\text{emf} = 12 \text{ V}$ ,  $L = 53 \text{ mH}$   
 $R = 0.35 \text{ ohm}$

Therefore,  $I = \frac{E}{R} = \frac{12}{0.35} = 34.28 \text{ A}$

Energy stored in the magnetic field

$$W = \frac{1}{2} LI^2$$

$$= \frac{1}{2} \times 53 \times 10^{-3} \times (34.28)^2$$

$$W = 31 \text{ J}$$

15. **Ans. (c)**

Given  $L = 0.2 \text{ mH}$ ,  $C = 2 \mu\text{F}$

For resonance frequency:

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

$$= \frac{1}{2\pi\sqrt{0.2 \times 10^{-3} \times 2 \times 10^{-6}}}$$

$$= \frac{1}{2\pi \times 2 \times 10^{-5}}$$

$$f_r = \frac{10^5}{4\pi}$$

$$f_r = 7957.74 \text{ Hz}$$

$$f_r = 7.96 \text{ kHz}$$

16. **Ans. (c)**

The air pressure inside the cathode ray tube is low. Because if we increase the pressure of gas present inside the tube then the number of atoms of the gas increases.

i.e. we have  $PV = nRT$

Hence, 0.01 to 0.001 mmHg used in a discharge tube for production of cathode ray.

17. **Ans. (c)**

The position of the input and output signals of CE amplifier is 180 degree out of phase.

	CB	CE	CC
Phase shift application	0° for high frequency	180° for audio frequency	0° for impedance matching

18. **Ans. (d)**

Millikan oil drop experiment measured the charge of an electron. The force on any electric charge and the electric field, Millikan was able to measure the amount of electric force and magnitude of electric field on the tiny charge of an isolated oil droplet and from the data determine the magnitude of the charge itself.

19. **Ans. (d)**

A bulb is connected in series with a solenoid and glowing in an AC circuit, if a soft iron core is introduced inside the solenoid, the magnetic field inside the solenoid is increased. This increases the inductance of the solenoid increases. Consequently, a large fraction of the applied AC voltage appears across the solenoid. As a result of this, there is a less voltage across the bulb and the brightness of the bulb decreases.

20. **Ans. (c)**

A charged particle is moving in a circular path in a magnetic field. If the velocity of the charged particle increase suddenly then kinetic energy of charge will increase.

$$\text{Kinetic energy} = \frac{1}{2} mv^2$$

$m = \text{mass}$

$V = \text{velocity}$

It velocity increases then momentum, angular frequency and angular acceleration increase but radius will unaffected.

21. **Ans. (c)**

A proton has a mass =  $m$  and charge =  $q$

Mass of an alpha particle  $m = 4m$  and charge  $q = 2q$

K.E. of proton = K.E. of alpha particle C

$$0.5 \text{ mV}^2 = 0.5 \text{ mV}'^2$$

$$V^2 = 4V'^2 = \frac{V}{V'} = \sqrt{4} = 2$$

Radius of charged particle in uniform magnetic field is

$$r = \frac{mv}{qB}$$

$$\frac{R_1}{R_2} = \frac{m}{m'} \times \frac{V}{V'} \times \frac{q'}{q}$$

$$= \frac{1}{4} \times \frac{2}{1} \times \frac{2q}{q} = \frac{1}{1}$$

22. **Ans. (c)**

In RLC parallel circuit, at resonance, the impedance of the parallel circuit is at its maximum value and equal to the resistance of the circuit ( $Z = R$ ), and current will be minimum.

The dynamic impedance of RLC circuit

$$Z = \frac{L}{RC}$$

	Item	Series (R-L-C)	Parallel (R-L-C)
1.	Impedance at resonance	Minimum	Maximum
2.	Current at resonance	Maximum	Minimum
3.	Effective impedance	R	L/CR

23. **Ans. (c)**

Given  $f = 50 \text{ Hz}$

We know that

The angular frequency of sine wave

$$\omega = 2\pi f = 2\pi \times 50$$

$$= 100\pi$$

24. *Ans. (c)*

Given,  $I_{ms} = 10A$

RMS value of half-wave rectifier

$$I_{ms} = \frac{I_m}{2}$$

$$I_{ms} = 2 \times 10 \\ = 20 \text{ Amp}$$

RMS value of full wave rectifier

$$I_{ms} = \frac{I_m}{\sqrt{2}} = \frac{20}{\sqrt{2}} = 14.14 \text{ Amp}$$

25. *Ans. (c)*

Given,  $i = 14.14 \sin\left(\omega t + \frac{\pi}{6}\right)$

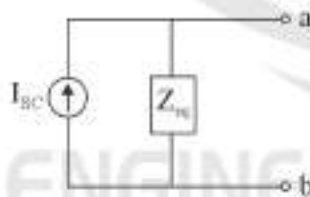
Comparing with equation

$$i = I_m \sin(\omega t + \phi)$$

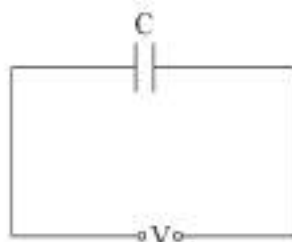
$$I_{ms} = \frac{I_m}{\sqrt{2}} = \frac{14.14}{\sqrt{2}} = 9.99 \approx 10A$$

26. *Ans. (a)*

**Norton's Theorem :** A linear, active RLC network which contains one or more independent or dependent voltage or current sources can be replaced by single current source  $I_{sc}$  in shunt with equivalent impedance  $Z_{eq}$ .

27. *Ans. (a)*

Current increases when the frequency of the voltage applied across a capacitor increases.



$$I_c = \frac{V}{X_c} = \frac{V}{1/\omega C} = V\omega C$$

$$I_c = V_2 \pi f C$$

$$I_c = 2\pi f C V$$

Hence, the frequency of the applied voltage across a capacitor increase, current increases.

28. *Ans. (d)*

An electrical generator is a machine which converts mechanical energy (or power) into electrical energy (or power)

Prime mover is the mechanical energy source used to drive a DC generator.

29. *Ans. (c)*

Leading of power factor makes the terminal voltage of an alternator increase with load.

For alternator-

$$E_c \cos \delta = V_a \text{ normal excitation (unity p.f.)}$$

$$E_c \cos \delta > V_a \text{ over excitation machine (lagging p.f.)}$$

$$E_c \cos \delta < V_a \text{ under excitation machine (leading p.f.)}$$

Hence, while for leading capacitive load conditions, the terminal voltage increase as load current increase.

30. *Ans. (d)*

Given  $N_s = 375 \text{ rpm, } f = 50 \text{ Hz}$

$$P = \frac{120f}{N_s} = \frac{120 \times 50}{375} = 16$$

31. *Ans. (d)*

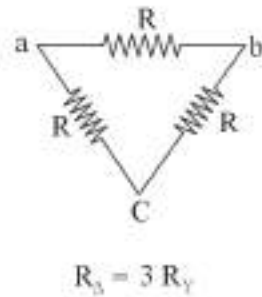
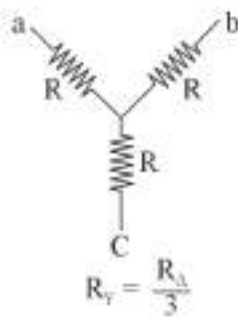
Copper loss is the power loss as heat in the windings; it is caused by the flow of current through the coils of the DC armature or DC field. This loss varies directly with the square of the current in the armature or field and the resistance of the armature or field coils.

32. *Ans. (b)*

The equivalent star value when three resistances, each of  $R$  ohm, are connected in delta.

$$R_Y = \frac{R_\Delta}{3}$$

$$R_\Delta = 3R_Y$$



33. **Ans. (d)**

Given that,  $\phi_1 = 0.1 \text{ m Wb}$ ,  
 $N_1 = 1000 \text{ turns}$   
 $N_2 = 2000 \text{ turns}$

For mutual inductance  $M = \frac{N_2 \phi_1}{I_1}$

Flux produced in X coil

$$\phi_1 = 0.1 \text{ m Wb}$$

$$= 0.1 \times 10^{-3} \text{ Wb}$$

Flux linked with Y coil,

$$\phi_2 = 0.1 \times 10^{-3} \times 0.6$$

$$= 0.06 \times 10^{-3} \text{ Wb}$$

Thus,

$$M = \frac{N_2 \phi_1}{I_1}$$

$$= \frac{2000 \times 0.06 \times 10^{-3}}{1} = 0.12 \text{ H}$$

34. **Ans. (a)**

Regulation = 6% at 0.8 p.f. lagging  
 and  $N_s = 1200 \text{ rpm}$   
 Regulation = 6% at 0.8 p.f. lagging  
 and  $N_s = 1100 \text{ rpm}$   
 Generated emf =  $4.44 \phi_m f T$

$$f = \frac{NP}{120}$$

$$f \propto N$$

$$E_g \propto N$$

If speed of alternator decreased from 1200 to 1100 rpm then generated emf or no load emf decrease. Voltage drop of alternator remain same

$$\text{Voltage regulation} = \frac{E - V}{V}$$

If generated or no load voltage decrease then voltage regulation decrease.

It give regulation less than 6%.

35. **Ans. (a)**

The open circuit test on transformer is used to determined core losses in transformer and parameters of the shunt branches of the equivalent circuit of the transformer. The instruments are connected on LV side while HV side of the transformer is kept open. The voltage at rated frequency is applied to the LV side with the help of a varies of variable ratio auto transformer.

36. **Ans. (d)**

Fractional pitch winding of alternator is done for reduce the harmonics in generated emf.

$$\text{Short pitch factor} = \cos\left(\frac{\alpha}{2}\right)$$

Here  $\alpha$  = short pitch angle.

$$\text{Distributed factor } K_d = \frac{\sin(m\beta/2)}{m\sin(\beta/2)}$$

$m$  = number of slot per pole per phase.

$$\beta = \frac{180}{\text{number of slot per pole}}$$

37. **Ans. (b)**

There is a limit to the mechanical load that can be applied to a synchronous motor. As the load is increased, the torque angle  $\delta$  also increases until the condition arises when the rotor is pulled out of synchronism and the motor is stopped.

When load increases always load current increases.

38. **Ans. (a)**

At leading power factor the voltage regulation is given by  $I(R\cos\phi - X\sin\phi)$ . Thus, at a particular condition of angle  $\phi$  we may get zero voltage regulation. While in lagging power factor case we have positive sign in the above formula.

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