

INTEGRAL COACH FACTORY :: CHENNAI 38

Question Paper for Selection of Assistant Electrical Engineer Through Limited Departmental competitive Examination

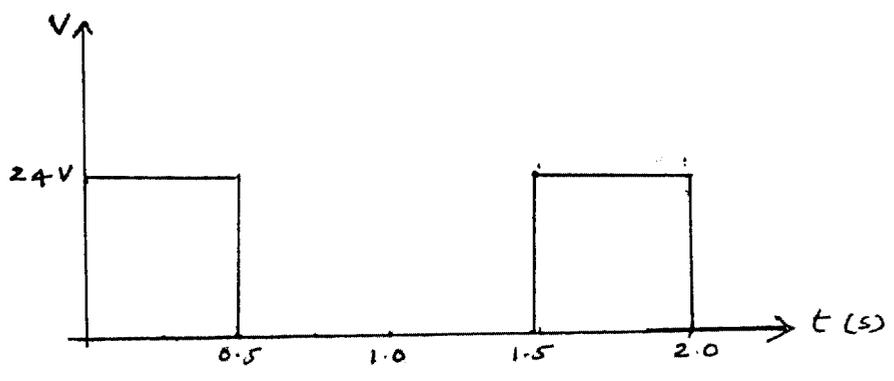
PAPER - I

Date : 21.11.2013

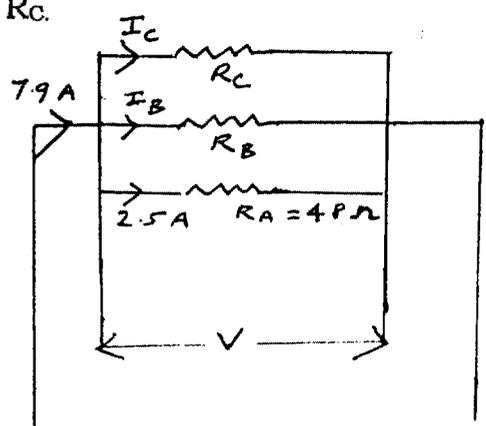
Time : 3 hrs. Max. Marks : 150

NOTE : Answer any 15 (FIFTEEN) questions. Each question carries 10 marks.

- 1. Compute the average and RMS values of the Voltage waveform shown in the figure below:



- 2. Three Resistors A, B and C are connected in parallel as shown in the figure below and take a total current of 7.9 Amps.  $R_A = 48 \text{ Ohms}$  and takes 2.5 Amps,  $I_B = 2I_C$ . Calculate (i)  $I_B$  and  $I_C$  (ii) the line voltage and (iii)  $R_B$  and  $R_C$ .



- 3. A coil having resistance of 5 Ohms and an inductance of 0.2 H is connected in series with a 40 -  $\mu\text{F}$  capacitor. The voltage applied to the circuit is 220 Volts. Determine the maximum current and corresponding frequency. Also find the voltage across the capacitor and coil for this frequency.

4. A 3-phase motor operating on a 440 Volt, 50 Hz supply system is developing 50 KW at an efficiency of 90% and a Pf of 0.8. Calculate the (i) line current and (ii) phase current if the windings are delta connected.
5. (i) Explain the various methods of speed control of a DC series motor. (7 marks)  
(ii) Draw the torque speed characteristics of a DC series motor and explain why this is suitable for traction application. (3 marks)
6. Give the torque speed characteristics in the following types of speed control of 3-phase induction motor and explain the advantages and disadvantages of each method:
  - (i) Stator voltage control.
  - (ii) V/f control.
  - (iii) Adding external resistance in the rotor circuit.
7. Explain the working principle of a synchronous motor and explain why synchronous motors are not self-starting.
8. Describe the construction details of a power transformer and explain the functions of various parts.
9. A single phase 50 Hz., 50-KVA transformer has a full load primary current of 260 Amps and total resistance referred to primary is 0.005 Ohms. If the iron loss amounts to 210 Watts, find the efficiency at full load and half load at unity power factor.
10. Explain the salient features of Indian Electricity Act, 2003 and explain the role of Central Electricity Authority (CEA).
11. Who is the Electrical Inspector to Government (EIG) for Zonal Railways? Describe the role of EIG.
12. What are the different types of cables used for power distribution? Compare the advantages and disadvantages of these types.

13. What are the general points to be considered for selection of the type and size of cables?
14. Explain the working of single phase Energy Meter with a neat diagram.
15. Why damping is required in measuring instruments? What are the different methods of damping used in measuring instruments?
16. (i) Explain how magnetic materials are classified? (6 marks)  
(ii) What is magnetic hysteresis? Explain it with a B-H curve (4 marks)
17. Describe in detail the factors to be considered while designing a lighting system for workshop interior lighting.
18. (a) Explain the working principle of an induction lamp. (5 marks)  
(b) Compare the advantages and disadvantages of the following lamps. (5 marks)
- (i) Metal halide lamps
  - (ii) LED lamps
  - (iii) Induction lamps
19. Write short notes on any **2 (two)** of the following:
- (a) Public Interest Litigation
  - (b) Training programme conducted by Rajbasha Department
  - (c) Incentive Scheme for promotion of Rajbasha
  - (d) Induction Generator
20. Write short notes on any **2 (two)** of the following:
- (a) Indian Mars Mission
  - (b) Right to Education Act
  - (c) Section 3(3) of the Official Language Act
  - (d) Nuclear Power Station

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**PAPER - II**

Date : 22.11.2013

Time : 3 hrs.

Max. Marks : 150

**Note:** Answer any **4 (four)** questions from Part-A, **1(one)** question from Part-B and **1 (one)** question from Part-C.

**PART - A**

Answer any **4 (four)** questions. Each question carries 25 marks.

1. (a) Explain how a 4-stroke IC engine works. (10 marks)
- (b) What are the energy conservation measures taken in ICF to reduce electrical energy consumption? (7 marks)
- (c) Explain the procedure for connecting two DG sets in parallel (8 marks)
  
- 2.(a) Draw the schematic diagram of a 750 Volts EOG system and explain its function. (10 marks)
- (b) Explain the function of a magnetic amplifier regulator. (8 marks)
- (c) Explain the fire prevention measures adopted in non-AC coaches. (7 marks)
  
3. (a) Explain how the air brake system functions in a conventional AC EMU train. (10 marks)
- (b) Explain the function of TCMS in a 3-phase IGBT based EMU. (8 marks)
- (c) What are the advantages of 3-phase drive over a conventional drive? (7 marks)
  
4. (a) What is adhesion? Explain in detail the factors that affect adhesion. (7 marks)
- (b) Give a schematic layout of the air duct system in a conventional 2 tier AC coach. (10 marks)
- (c) What tests are performed in a AC 2 tier coach after the completion of production activity and before despatch? (8 marks)

5. (a) Draw the schematic diagram of a bogie used in AC EMU and explain how the tractive effort is transmitted from the bogie to the body. (13 marks)

(b) Explain the sequence of notching in conventional EMUs. (12 marks)

6. Write short notes on the following: (5 x 5 = 25 marks)

- (a) Refrigerant cycle
- (b) BLDC fan
- (c) Earthing
- (d) Package air-conditioning units
- (e) IGBT

7. (a) Draw the schematic diagram of the HT distribution system in ICF. (10 marks)

(b) What are the protective measures provided in HT sub-station (7 marks)

(c) Explain different types of pumps. What are the relative merits? (8 marks)

### **PART - B**

(Marks : 25)

1. Write short notes on any 5 (five) of the following: (5 x 5 = 25 marks)

- (a) Factories Act
- (b) Staff Council
- (c) Pass Rules
- (d) New Pension Scheme
- (e) Right to Information Act
- (f) HOER
- (g) Retirement benefits for Railway employees

### **PART - C**

(Marks : 25)

1. Write short notes on any 5 (five) of the following: (5 x 5 = 25 marks)

- (a) Draft Paras
- (b) Schedule of Powers
- (c) August Review
- (d) Heads of Allocation
- (e) Limited Tender
- (f) Work Estimates
- (g) Temporary Establishment

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