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Question Paper Code : 21467

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Second Semester

Civil Engineering

GE 2151/EE 26/EE 1153/10133 EE 206/080280011 — BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to Aeronautical, Automobile, Marine, Mechanical, Production, Chemical, Petroleum Engineering Biotechnology, Polymer, Textile, Textile (Fashion), Plastic Technology, Environmental Engineering, Geoinformatics Engineering, Industrial Engineering, Industrial Engineering and Management, Manufacturing Engineering, Material Science and Engineering, Mechanical and Automation Engineering, Mechatronics Engineering, Petrochemical Engineering, Chemical and Electrochemical Engineering, Petrochemical Technology, Pharmaceutical Technology and Textile Chemistry)

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A $120\ \Omega$ resistor has a specified maximum power dissipation of 1 W. Calculate the maximum current level.
2. Three inductive coils each with resistance of $15\ \Omega$ and an inductance of $0.03\ \text{H}$ are connected in star to a 3ϕ 400 V, 50 Hz supply. Calculate the phase voltages.
3. A dc shunt generator supplies a load of 10 kW at 220 V through feeders of resistance $0.1\ \Omega$. The resistance of armature and shunt field windings is $0.05\ \Omega$ and $100\ \Omega$ respectively. Calculate the terminal voltage.
4. In a single phase transformer, $N_p = 350$ turns, $N_s = 1050$ turns, $E_p = 400\ \text{V}$. Find E_s .
5. Write any two salient points on a p-n junction.
6. When should a transistor be biased? Name two common biasing circuits.
7. Find the following binary difference :
1011010 – 0101110

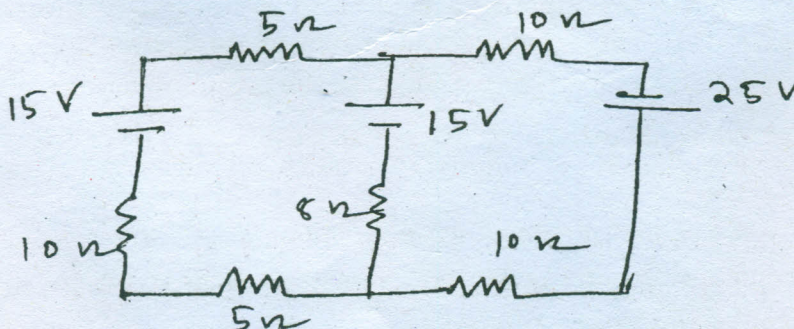
8. An active high S-R latch has a '1' on the S-input and '0' on the 'R' input. What state is the latch in?
9. As related to amplitude modulation, what is overmodulation, undermodulation and 100% modulation?
10. Why are digital signals said to be noise immune?

PART B — (5 × 16 = 80 marks)

11. (a) (i) (1) State and explain Kirchoff's laws. (4)
- (2) A sinusoidal current wave is given by $i = 50 \sin(100\pi t)$. Determine the root mean square value. (4)
- (ii) Write short notes on moving Iron Measuring Instruments under the following headings :
- (1) Operating principle. (4)
- (2) Classification. (2)
- (3) Advantages and disadvantages. (2)

Or

- (b) (i) 3ϕ , 200 kW, 50 Hz delta connected induction motor is supplied from a 3ϕ , 440 V, 50 Hz supply system. The efficiency and power factor of 3ϕ induction motor are 91% and 0.86 respectively. Calculate :
- (1) (A) Current in each motor phase (2)
- (B) Line current. (2)
- (2) Phasor diagram of the circuit. (4)
- (ii) Find the current in the 8Ω resistor in the following circuit using Kirchoff's laws. (8)



12. (a) (i) Write short notes on the types of DC machines. (8)
- (ii) With neat diagrams explain the construction and principle of operation of a single phase transformer. What are the characteristics of an ideal transformer? (8)

Or

- (b) (i) (1) Explain the basic nature of the emf induced in the armature of a d.c. machine. (4)
- (2) How can the alternating current waveform in the armature be converted into a dc waveform? (4)
- (ii) A 200 V dc shunt motor takes a total current of 100 A and runs at 750 rpm. The resistance of the armature winding and of shunt field winding is 0.1 and $40\ \Omega$ respectively. Find the torque developed by the armature. (8)
13. (a) (i) With neat diagrams explain how a voltage regulator circuit regulates the output voltage under the following conditions :
- (1) Load resistance increases. (4)
- (2) Input voltage decreases. (4)
- (ii) (1) Using the two diode analogy explain why the base-emitter junction has to be forward biased to provide collector current.
- (2) Sketch a common emitter amplifier circuit with an NPN transistor. (8)

Or

- (b) (i) (1) Explain the avalanche effect that accounts for the reverse breakdown voltage (PIV) of a diode. (4)
- (2) What is the effect on capacitance of a PN junction diode as forward and reverse bias are applied? (4)
- (ii) (1) Explain the amplifying action of a transistor. (6)
- (2) In a CE, I_B changes from $100\ \mu\text{A}$ to $150\ \mu\text{A}$ which causes a change in I_C from 5 mA to 7.5 mA. If V_{CE} is held constant at 10 V, find $\beta_{ac}(h_{fe})$. (2)

14. (a) (i) (1) Reduce the following expressions using Boolean algebra postulates :

$$\rightarrow a'b'c' + a'b'c + ab'c' + abc$$

$$\rightarrow [(A+B)' + C']' \quad (4)$$

- (2) Realise the given expression using only NAND gates and inverters :

$$xyz + x'y'z' \quad (4)$$

- (ii) Design a full adder, construct the truth table, simplify the output equations and draw the logic diagram. (8)

Or

- (b) (i) (1) Draw the logic diagram for a four bit parallel input parallel output register. Indicate inputs, outputs and a negative edge triggered clock. (4)

- (2) Draw a simple ring counter and briefly describe its counting action. (4)

- (ii) (1) Give a brief explanation of an A/D conversion and the need for the A/D conversions. (4)

- (2) Convert 95.0625_{10} to binary. (4)

15. (a) (i) Draw a typical television video signal. Explain how this is converted to an image on a TV screen. (6)

- (ii) What is the need for modulation? Explain the principles behind amplitude modulation and frequency modulation. Compare and contrast the two types of modulation. (10)

Or

- (b) (i) With neat diagrams explain any one method of amplitude modulation and its corresponding demodulation. (8)

- (ii) Write short notes on the following modes of communication :

- (1) Microwave. (4)

- (2) Optical fiber. (4)