

6. (a) Draw the small signal model of n-p-n transistor. Write down describing equations connecting input and output.
- (b) Explain the principle of Astable multi-vibrator with the help of a circuit diagram.
- (c) State the condition for generation of oscillations. Derive the expression for frequency of RC coupled oscillator. 50
7. (a) Derive an expression for generated emf of dc generator from first principles.
- (b) A 250 V dc shunt motor on no load runs at 1000 rpm and takes 5 A. The armature and shunt field resistances are 0.2 ohm and 250 ohms respectively. Calculate the speed when it is loaded and taking a current of 50 A if the armature reaction weakens the flux by 3%.
- (c) Explain the concept of commutation and its effect on the performance of dc machine. 50
8. (a) Draw the equivalent circuit of single phase transformer. How the parameters are found from the results of open circuit and short circuit tests ?
- (b) Explain the principle of operation of 3-phase induction motor with a neat diagram.
- (c) The maximum efficiency of a 500 kVA 3300/500V, single phase transformer is 97% and occurs at 75% of full load and upf. If the leakage reactance is 10%, calculate the voltage regulation at full load 0.8 pf lagging. 50

Total No. of Printed Pages : 4

Roll No.

1[CCE.M]1

Electrical Engineering–I

(09)

Time : Three Hours

Maximum Marks : 300

INSTRUCTIONS

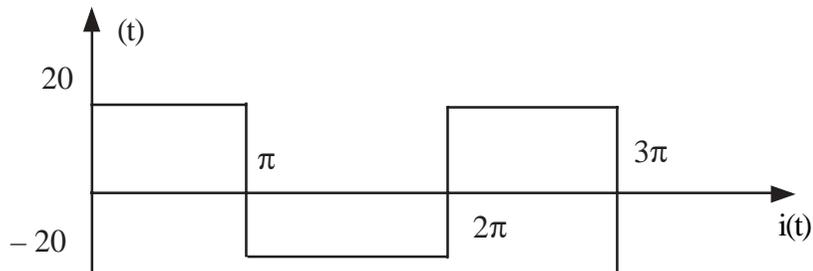
- (i) Answers must be written in English.
- (ii) The number of marks carried by each question is indicated at the end of the question.
- (iii) The answer to each question or part thereof should begin on a fresh page.
- (iv) Your answers should be precise and coherent.
- (v) The part/parts of the same question must be answered together and should not be interposed between answers to other questions.
- (vi) Candidates should attempt question nos. **1** and **5** which are compulsory and any **three** more out of the remaining questions, selecting at least **one** question from each section.
- (vii) If you encounter any typographical error, please read it as it appears in the text book.
- (viii) Candidates are in their own interest advised to go through the General Instructions on the back side of the title page of the Answer Script for strict adherence.

- (ix) No continuation sheets shall be provided to any candidate under any circumstances.
- (x) Candidates shall put a cross (X) on blank pages of Answer Script.
- (xi) No blank page be left in between answer to various questions.

SECTION-A

1. Answer any **three** of the following :
 - (a) State and prove Superposition Theorem. 25
 - (b) Explain the working principle of single phase energy meter with the help of a neat diagram. 25
 - (c) Explain how signals are transmitted between earth station and satellite. 25
 - (d) Describe the principle of operation of Cathode-Ray Oscilloscope. 25

2. (a) State and prove Thevenin's Theorem.
- (b) A resistor of 130 ohms and a capacitor of 30 micro farads are connected in parallel. This combination is connected across 230 V, 50 Hz supply. Find the real power and reactive power consumed, power factor, phase difference between total current and applied voltage.
- (c) Compute the Fourier transform of the following waveform :



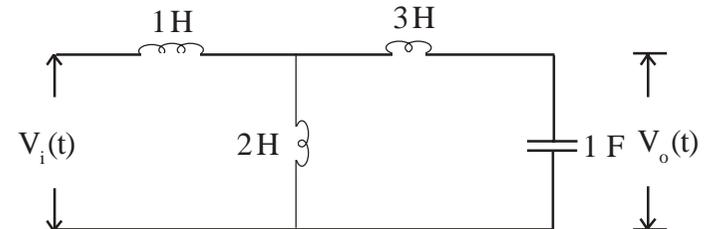
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3. (a) Explain the principle of operation of moving coil instrument with a neat sketch.
- (b) Draw the circuit of single phase power measurement with three ammeters. Draw the phasor diagram and derive an expression for power in terms of readings of ammeters.
- (c) Draw the circuit of Desauty Bridge and explain how unknown capacitance can be measured with above bridge. 50

4. (a) Write down Maxwell's equations. Explain the significance of these equations.
- (b) Explain how energy is transmitted in space through electromagnetic waves.
- (c) A charge Q is distributed uniformly around a thin ring of radius b which lies in x-y plane with its centre at the origin. Locate the point on the positive z-axis where electric field is strongest. 50

SECTION-B

5. (a) Obtain the transfer function of the following circuit. 25



- (b) Draw and explain static V-I characteristics of UJT(Uni Junction Transistor). Explain the principle of Colpitt's oscillator. 25
- (c) A two-winding transformer is connected as an auto transformer to step up the voltage. Derive an expression for saving of copper. 25