৪৫ তম বিসিএস লিখিত পরীক্ষার প্রশ্ন

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বিষয়- ইলেকট্রিক্যাল ইঞ্জিনিরিং

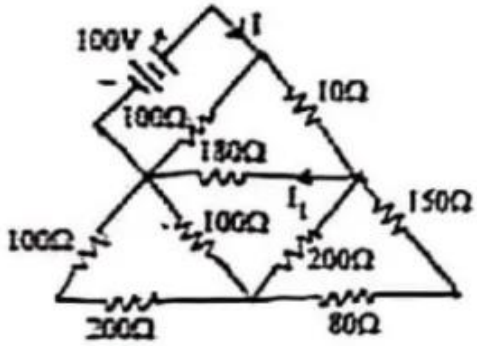
বিষয় কোড-৮৯১

সময়- ৪ ঘন্টা [ডান দিকের সংখ্যা সংশিষ্ট প্রশ্নের পূর্ণমান জ্ঞাপক] পূর্ণমান-২০০

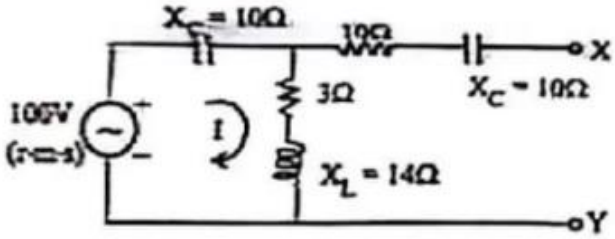
Group A
Marks—20×5=100

Marks

1. (a) Find currents I and I_1 in the following circuit. 10

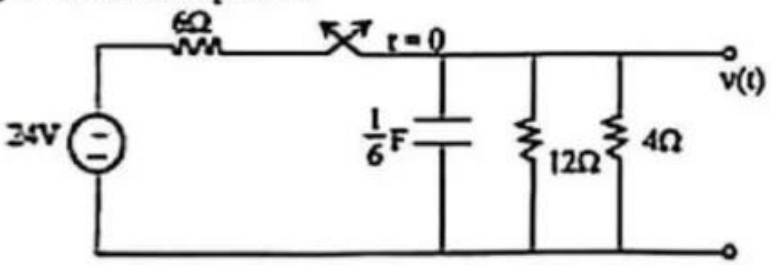


(b) Determine the Thevenin's equivalent circuit at terminal X–Y of the following circuit. 8



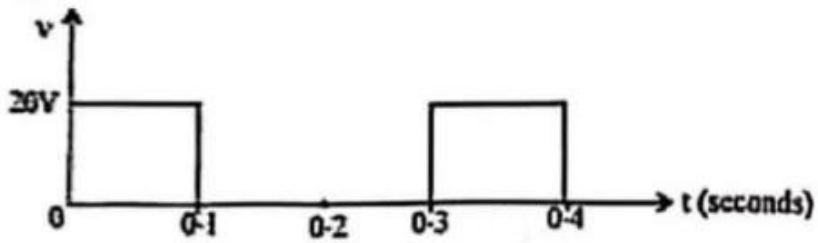
(c) State maximum power transfer theorem. 2

2. (a) If the switch in the following circuit opens at t = 0, find v(t) for t ≥ 0 and the initial energy stored in the capacitor. 10



(b) Show that a series RL circuit is a low pass filter if the output is taken across the resistor. Calculate the cut-off frequency (f_c) if L = 2 mH and R = 10 kΩ. 5

(c) Compute the average and effective values of the square voltage wave shown in the following figure. 5



3. (a) Define voltage regulation of a transformer. A 11000/230V, 150 kVA single phase, 50 Hz transformer has cure loss of 1·4 kW and full load cu loss of : 1·6 kW, Determine— 10
(i) the kVA load for maximum efficiency and value of maximum efficiency at unity power factor.
(ii) the efficiency at half F.L (full load) and 0·8 power factor (leading).

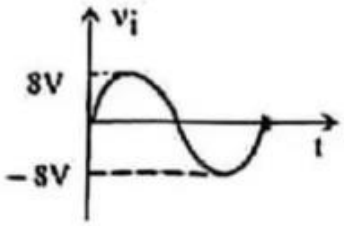
(b) Describe briefly the effect of varying excitation upon the armature current and power factor of a 3–ϕ synchronous motor when the input power to the motor is kept constant. 10

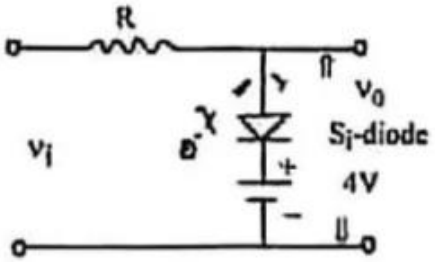
4. (a) What is Flip-Flop? Explain the operation of R–S Flip-Flop with suitable diagram and also represents its truth table. 10

(b) What is the problem associated with high $\frac{dV}{dt}$ in SCR? How this problem can be resolved? 10

5. (a) Why starters are necessary to start 3–ϕ induction motors? Write a short note on a star-delta starter. 8

(b) Sketch v_0 for the input and network given in the following figure. 4





(c) Sketch the speed-torque curve of a DC series motor and discuss its characteristics. 8

Group B

Marks—20×5=100

6. (a) Briefly describe the various types of faults that occur in a power system. What could be the effects of faults within the power system? 10

(b) What factors determine the choice of nuclear fuel? What type of emission occurs from a nuclear power plant? Explain. 10

7. (a) State Nyquist sampling theorem. Why it is necessary to follow Nyquist theorem during analog to digital conversion of a signal? Explain with necessary figures. 10

(b) A message signal with a frequency of 5 kHz modulates a carrier of 88 MHz to produce FM signal with a modulation index of 1. Sketch the spectrum, and find the bandwidth and spectral power density of the FM signal. 10

8. (a) What is noise? Explain the characteristics of various types of noise created in telecommunication system. 10

(b) What is hand-off margin? How proper hand-off can be made to prevent call drop? Explain with necessary figures. 10

9. (a) What is multiplexing? Explain the principles of Time Division Multiplexing (TDM) with a sketch to show how the interleaving of channels takes place. 10

(b) How does the trip circuit of a circuit breaker work? Also describe the fault clearing process in briefly. 10

10. (a) An overhead 3-phase transmission line delivers 5000 kW at 22 kV at 0·8 p·f lagging. The resistance and reactance of each conductor are 4Ω and 6Ω respectively. Determine— 6
(i) Sending end voltage (ii) Percentage regulation and (iii) Transmission efficiency.

(b) What is meant by mobile communication? Distinguish between mobile radio and cellular mobile radio system. 6

(c) Discuss electricity tariff setting policy. Why and how this differ from region to region? 8