Total No. of Questions – [10] Total No. of Printed Pages: 4

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DECEMBER 2019 / ENDSEM

F. Y. B.TECH. (COMMON) (SEMESTER – I)

COURSE NAME: BASIC ELECTRICAL ENGINEERING

COURSE CODE: ET 10182A

(PATTERN 2018)

Time: [2 Hours] [Max. Marks: 50]

(*) Instructions to candidates:

1) **Attempt Q.1, Q.2, Q.3, Q.4 Or Q.5, Q.6 Or Q.7, Q.8 Or Q.9 and Q.10**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed.**
4) **Use suitable data wherever required.**

Q.1) a) Applying Norton's theorem, determine the current flowing through 6 Ω for the network shown in the fig.1 [4]

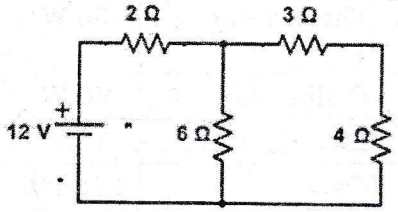

Fig.1

OR

b) Apply Thevenin's theorem to calculate current flowing through 6 Ω for the above network shown in the fig.1. [4]

Q.2) a) A resistance R, inductance L = 0.01 H and a capacitance C are connected in series. When an alternating voltage v = 400 sin(3000t – 20⁰) Volt is applied to the series combination, the current flowing is 10 √2 sin(3000t – 65⁰) Amp. Find the values of R and C. Find the power consumed by the circuit. [4]

OR

b) Define RMS value, Average value, form factor, peak factor. [4]

Q.3) a) A single phase 5 kVA transformer has 400 turns on its primary and 1000 secondary turns. The net cross-sectional area of the core is 60 cm². When the primary winding is connected to 500 V, calculate (i) maximum value of flux density in the core with 50 Hz supply (ii) voltage induced in the secondary winding and (iii) secondary full load current. [6]

OR

b) Derive EMF equation for single phase transformer. State the formulae for voltages induced in primary and secondary winding. [6]

Q.4) a) A dc electric motor drives a locomotive takes a current of 3.72 A when connected to 11 kV supply while moving up on an incline plane of 1 in 100. The mass of the locomotive is 10000 kg while frictional force offered by the track is 10×9.81N per 1000 kg mass of the locomotive. If the overall efficiency of the system is 90%, calculate the steady speed at which the locomotive is moving. [5]

b) Derive with the help of a neat phasor diagram an expression showing the relationship between line current and phase current for a three phase balanced delta connected unity power factor load and connected across a symmetrical three phase a.c. supply. [5]

OR

Q.5) a) The daily usage pattern of various electrical appliances in a typical house is as given below. [5]

Sr. No.	Electrical Appliance	Power rating	Quantity	Usage Time
1	Fluorescent Tube	36 W	5	5 Hrs.
2	Ceiling Fan	70 W	5	6 Hrs.
3	Electric Iron	1 kW	1	15 min
4	Oven	2.15 kW	1	10 min
5	Television set	85 W	1	4 Hrs.
6	Washing Machine	500 W	1	40 min
7	Refrigerator	65 W	1	24 Hrs.
8	Miscellaneous	50 W	1	3.6 Hrs.

Calculate the daily electricity consumption in kWh and monthly electricity bill for a month of 30 days at the rate of Rs. 6.80/- per kWh.

b) Draw a neat connection and phasor diagram for a three phase balanced star connected resistive load of resistance R in each phase across a symmetrical three phase a.c. supply. [5]

Q.6) a) With usual notations, derive e.m.f. induced in case of a dc generator. [5]

b) A dc shunt motor is supplied from a constant 200 V supply. The armature winding resistance is 0.4 Ω and the field winding resistance is 100 Ω. When the motor develops rated torque, it draws a total line current of 17 A. [5]

Determine the power developed by armature under these conditions.

OR

Q.7) a) A 4-pole DC shunt motor takes 22 A from 220 V supply. The armature and field resistances are 0.5 Ω and 100 Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20 mWb, calculate the speed and gross torque. [5]

b) Draw torque-armature current, speed-armature current and speed-torque characteristics of a dc shunt motor. [5]

Q.8) a) A 6 pole, 50 Hz, three phase induction motor runs at 960 rpm when the torque available at the shaft is 200 N-m. If the stator losses are 1500 W and friction and windage losses are 500 W. Find i) rotor copper losses and ii) efficiency of the motor. [5]

b) Draw and explain torque-slip characteristics in case of three-phase induction motor. [5]

OR

Q.9) a) Write a note on resistance split phase type single phase induction motor with reference to following points [5]

- Neat circuit diagram
- Advantage
- Disadvantage
- Application

b) A four pole, three phase induction motor is energized from a 60 Hz ac supply. It is running at a load condition for which the slip is 0.03. Determine the followings: [5]

- Rotor speed in rpm
- Rotor current frequency in Hz
- Slip speed
- Speed of the rotor rotating magnetic field with respect to the stator rotating magnetic field in rpm

Q.10) a) In Fleming's right hand rule, which of the following statement is correct? [1]

i. First finger indicates field, Middle finger indicates current and thumb indicating direction of motion.
ii. First finger indicates current; Middle finger indicates field and thumb indicating direction of motion.
iii. First finger indicates direction of motion, Middle finger indicates field and thumb indicates current.
iv. First finger indicates field, Middle finger indicates direction of motion and thumb indicates current.

b) In a lap wound dc machine, the number of parallel paths is equal to [1]

i. number of poles
ii. number of poles plus 2
iii. number of poles minus 2
iv. two

c) A four pole lap wound armature has 144 slots with two coil sides per slot and each coil having two turns. If the flux per pole is 20mWb and generated emf is 138.24 V then the speed in rpm at which the generator must be driven is [1]

i. 180
ii. 360
iii. 720
iv. 540

d) The speed of rotating magnetic field of 8 pole, 60 Hz induction motor is [1]

i. 3000 rpm
ii. 1500 rpm
iii. 900 rpm
iv. 750 rpm

e) The maximum possible speed of rotating magnetic field in India can be observed when the induction motor is wound for [1]

i. Two poles
ii. Four poles
iii. Six poles
iv. Ten poles

f) The slip in case of a three phase induction motor is _____ at standstill condition. [1]

i. 0
ii. 1
iii. 0.5
iv. 0.2