DECEMBER 2017 / ENDSEM

F. Y. B. TECH. (COMMON) (SEMESTER - I)

COURSE NAME: BASIC ELECTRICAL ENGINEERING

COURSE CODE: 10174B

(2017 PATTERN)

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

(*) Instructions to candidates:
1) Answer Q.1 OR Q.2, Q.3 OR Q.4 and Q.5
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed
4) Use suitable data wherever required

Q.1) a) A 4 pole lap connected dc generator has 600 armature conductors and runs at 1200 rpm. This generator has a total flux of 24 mWb in it. Calculate i) the emf induced in the dc generator and ii) the speed at which it should be driven to produce the same emf when wave connected.   **[6]**

   b) Derive the torque equation of a dc motor with usual notations.   **[6]**

   c) State any two appropriate applications of i) dc shunt motor ii) dc series motor.   **[4]**

OR

Q.2) 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 wave connected with 300 conductors. If the flux per pole is 20 mWb, calculate the speed and gross torque developed by armature.   **[6]**

   b) Derive an emf equation of a dc generator with usual notations.   **[6]**

   c) Draw a neat diagram of a three point starter and label its various parts.   **[4]**

Q.3) a) Differentiate between slip ring and squirrel cage induction motors. (any 6 significant points)   **[6]**

   b) Draw and explain torque-slip characteristics of a three phase induction motor.   **[4]**

c) A three phase slip ring induction motor is wound for 6 poles and is supplied from 440 V, 50 Hz three phase ac supply. Calculate

   i. Synchronous speed

   ii. Rotor speed, when slip is 4%

   iii. Rotor frequency and slip when rotor runs at 900 rpm   **[4]**

<div align="center">OR</div>

Q4) a) Write a note on capacitor start single phase induction motor with respect to following points:-

   i) Neat circuit diagram with proper labels   ii) Advantages   iii) Disadvantages

   iv) Applications   **[6]**

  b) A 4 pole, 3-phase squirrel cage induction motor operates from a 440 V, three phase, 50 Hz, ac supply. Calculate:-

   i.   Speed at which the magnetic field of the stator is rotating

   ii. Speed of the rotor when tile slip is 0.04

   iii. Frequency of the rotor current when the slip is 0.03

   iv. Frequency of the rotor current at standstill.   **[4]**

  c) State any two advantages of squirrel cage and slip ring type of rotor used in three phase induction motor.   **[4]**

Q.5) Attempt following multiple choice questions: **[10x2=20 marks]**

  a)   If two resistances each of 30 Ω are connected in series across a   **[2]** voltage source of 15 V, then the voltage across each resistance will be

     i.   2 V

     ii.   7.5 V

     iii. 15 V

     iv. 0.5 V

  b)   For a given network as shown below, considering 5 Ω as a load   **[2]** resistance, the value of R_{eq} using Thevinin's theorem is

<div align="center">2</div>

i.   2 Ω

ii.   4.5 Ω

iii.   1.5 Ω

iv.   4 Ω
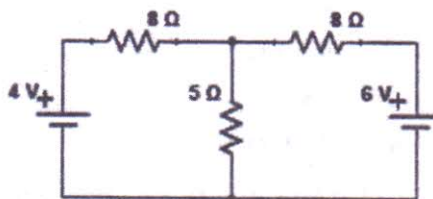
c) For a series R-C circuit if R is 10 Ω, C is 101.3 μF and supply **[2]** frequency is 50 Hz then total impedance Z in Ω will be:

i. $10 + j\, 0.1$

ii. $10 - j\, 31.42$

iii. $10 - j\, 0.1$

iv. $10 + j\, 31.42$

d) The peak value of an ac sinusoidal current is 14.14 A. Its **[2]** average value is:

i.   9 A

ii.   14.14 A

iii.   10 A

iv. $10\sqrt{2}$ A

e) For series R-L circuit if applied voltage is 230 V, current is 4 A **[2]** and phase angle Φ = 30⁰ then active power will be:

i.   736.7 W

ii.   750.8 W

iii.   Zero

iv.   796.7 W

f) The equivalent resistance between terminals X and Y for the **[2]** network shown in fig. below is

3

    i.   2 Ω
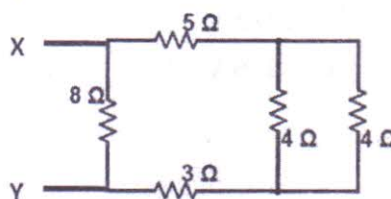
    ii.   4.44 Ω

    iii. 18 Ω

    iv. 4.55 Ω

g) The power in a three phase star connected balanced load is   **[2]**
_____ times the power in the same load connected in delta.

    i. two

    ii. three

    iii. one third

    iv. one half

h) In the phasor diagram drawn in case of a three phase star   **[2]**
connected balanced load, the angle between V_L and V_{ph} is

    i. 0^0

    ii. 60^0

    iii. 30^0

    iv. 120^0

i) The reading of wattmeters connected on supply side and load   **[2]**
side are 100 W and 80 W respectively during a direct loading
test of a 110 V/220 V transformer having a capacity of 1 KVA.
The efficiency will be

    i. 80 %

    ii. 87.56 %

    iii. 86.6 %

    iv. Data insufficient

j) A transformer has 70 turns on secondary and maximum flux   **[2]**
in core is 0.06 Wb. If it is working on a 50 Hz frequency,
induced emf in secondary will be

    i. 932.4 V

    ii. 1118.88 V

    iii. 1776 V

    iv. 1276 V