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G.R. No.	
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May 2018 / END - SEM

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

COURSE NAME : BASIC ELECTRICAL ENGINEERING

(2017 PATTERN)

Solution and scheme of marking

Time : [1 Hour]

[Max. Marks : 50]

(*) Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4
- 2) Figures to the right indicate full marks.

Q 1) a) $P = 6$, D.C. shunt motor, $I_{line} = 12A$,
 $V = 200V$, $R_a = 0.6\Omega$, $R_f = 100\Omega$,
 wave $A = 2$, $Z = 300$ $\phi / pole = 15 mwb = 15 \times 10^{-3} wb$
 $N = 2$. $T_a = 2$. $I_f = V/R_f = 200/100 = 2A$ — (01M)

$$I_a = I - I_f = 12 - 2 = 10A \text{ — (01M)}$$

$$V = E_b + I_a R_a \quad E_b = V - I_a R_a = 194V \text{ — (01M)}$$

$$E_b = \frac{\phi P N Z}{60 A} \quad 194 = \frac{(15 \times 10^{-3})(6) N (300)}{60 (2)} \therefore N = 862.22 \text{ rpm — (01M)}$$

$$T_a = \frac{1}{2\pi} \frac{PZ}{A} \phi I_a = 21.49 \text{ N-m — (02M)}$$

b) Correct Derivation steps - 04M

Correct formula - 02M

c) separately Ex - 01M,

shunt, series, compound(long & short) - 01M each

OR

Q2) a) $P=4$, lap $A=P$, $N=600$ rpm,

$E_g = 200V$, $\phi/\text{pole} = 0.04 \text{ Wb}$ slots = 100

$Z/\text{slot} = 2$

$$E_g = \frac{\phi P N Z}{60 A} \quad 200 = \frac{(0.04)(4)(600)Z}{60(4)}$$

$$Z = 500 \quad \text{---} \quad (0.4M)$$

$$Z/\text{slot} = \frac{500}{100} = 5 \quad \text{---} \quad (0.2M)$$

b) 3 graphs - 01M each

Explanation of characteristics - 01M each

c) Significance of back emf - 02M

Necessity of starter - 02M

Q3) a) Characteristic - 02M

Explanation - 02M

b) $P=6$, $V=400V$, $f=50\text{Hz}$

$$\textcircled{i} \quad N_s = \frac{120f}{P} = \frac{(120)(50)}{6} = 1000 \text{ r.p.m.} \quad \text{---} \quad (0.1M)$$

$$\textcircled{ii} \quad N=2 \quad S=5\% = 0.05$$

$$N = N_s(1-S) = 1000(1-0.05) = 950 \text{ rpm} \quad \text{---} \quad (0.1M)$$

$$\textcircled{iii} \quad \text{if } N=800 \text{ rpm} \quad f_z = ? \quad \%S = 2$$

$$\%S = \frac{N_s - N}{N_s} \times 100 = \frac{1000 - 800}{1000} \times 100 = 20\% \quad \text{---} \quad (0.1M)$$

$$f_z = S f = (0.20)(50) = 10 \text{ Hz} \quad \text{---} \quad (0.1M)$$

- c) i) & ii) point - 02M each
 iii) & iv) point - 01M each

OR

Q4) a) Correct explanation - 04M

b) $P = 4$, $V = 400V$, $f = 50Hz$, $N = 1400 \text{ rpm}$
 $f_2 = 2$ $N_3 = 120b/p = 1500 \text{ rpm}$ — (01M)
 $S = \frac{N_3 - N}{N_3} = 0.067$ $\%S = 6.67$ — (01M)
 $f_2 = S f = (0.067)(50) = 3.35 Hz$ — (02M)

c) 6 correct points - 01M each

Q.5

- a - iii
 b - iv
 c - i
 d - i
 e - iv
 f - i
 g - i
 h - iii
 i - ii
 j - iii