ELECTRICAL MACHINES AND UTILIZATION DME 109 AND DME 110 P MARCH/APRIL 2010 SERIES

THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING

END SEMESTER EXAMINATION TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATE.

- This paper contains FIVE questions.
- Attempt Question 1 and any other TWO questions
- Question 1 carries 30 marks. The other FOUR questions carry 20 marks each.

Q1(a). Define "grid system"	(5 marks)
(b). Explain how electricity is generated in a thermal power station.	(10 marks)
(c). Describe the THREE main parts of a d.c. motor.	(6 marks)

(d). A 3-phase motor has a power-factor of 0.4 lagging. Two wattmeters connected to measure power show the input as 30KW. Calculate the reading on each wattmeter.(9 marks)

Q2(a).	Define "transformer"					(5 marl	ks)
(b).	With the aid of labeled diagram	s, sh	ow thr	ee winding	s which are		
	(i) star c (ii	conn) de	ected elta con	nnected			(6 marks)
(c).	The input current to a 3-phase system is 14A. Calcula connection if th	step- ate tl ie vo	-down ne secc ltage t	transformer indary line ransformati	c connected voltage and on ratio is 4	to an 111 current 1 14.	KV supply for star-star (9
marks)			C				
Q3(a).	List any THREE factors to be	con	sidered	l during rev	vinding.	(3 marl	ks)
(b).	Describe "single –phasing" ar	nd sta	ate hov	v it can be o	detected in	3-phase r	notors. (5 marks)
(c).	With the aid of labeled diagram induction motor.	n, ex	xplain t	he principl	e of operati	on of a 3-	-phase (12 marks)
Q4.(a).	Explain why a single-phase a.c	c mo	tor is r	ot self-star	ting.	(5 marl	ks)
(b).	Draw circuit diagrams to illust motors.	rate	THRE	E methods	of starting s	single-ph	ase a.c. (6 marks)
(c). 84%,	A 4-pole, 250W, 115V, 60Hz c of 5.3A while running calculate the:-	apac at 17	citor-st 760 r.p.	art inductio m. If the fi	n motor tak 1ll-load effi	tes a full- ciency of	load current f the motor is
	(i)	-	motor (ii).	slip power-fac	ctor		(9 marks)
Q5. (a).	Describe the following:-						
	(i)		group	drives			

(ii).

individual drives.

(4 marks)

(b). State

- (i). THREE ways of cooling in 3-phase transformers.
 - (ii). ONE method used to very speed in 3-phase induction

phase induction motor.

(iii). The effect of interchanging any two phase lines

motors.

supplying a 3-

(6 marks)

(c). A 3-phase induction motor is wound for 4 poles and is supplied from a 50Hz system.

Calculate:-

(i). the synchronous speed

(ii). the speed of the motor when the slip is 4%.

(10 marks)

Q1.	(a).	Define "electric shock". (5 marks)	
	(b).	Explain how electricity is generated in a hydro power station. (10 mar	rks)
	(c).	Describe the following parts of a 3-phase induction motor:	
		(i). Stator (ii). Rotor (6 mark	cs)
Calcu	(d). late	The two-wattmeter method is used to measure the power absorbed by a 3 induction motor. The wattmeter readings are 12.5KW and – 4 the total power	-phase 4.8KW.
		(i). the total power absorbed by the machine(ii). the load power-factor. (9 mark)	(S)
Q2.	(a).	Describe the following	
		(i). group drives. (ii). individual drives (4 mark	cs)
	(b).	State	
		(i). THREE ways of cooling in 3-phase transformers.	
		(ii). ONE method used to vary speed in 3-phase induction motors.	
		(iii). The effect of interchanging any two phase lines supplying a 3- induction motor. (6 mar	-phase ks)
	(c).	A 3-phase induction motor is wound for 4 poles and is supplied from system. Calculate:-	a 50Hz
		(i). the synchronous speed	
		(ii). the speed of the motor when the slip is 4%. (10 marks)	
Q3.	(a).	Explain why a single-phase a.c. motor is not self-starting. (5 marks)	
	(b).	Draw circuit diagrams to illustrate THREE methods of starting single-pha motors. (6 mark	ise a.c. (s)
the	(c).	A 4-pole, 250W, 115V, 60Hz capacitor-start induction motor takes a fur- current of 5.3A while running at 1760 r.p.m. If the full-load effici- motor is 64%, Calculate:	ll-load ency of

		(i). the motor slip (ii). the power factor	
Q4.	(a).	List any THREE factors to be considered during rewinding. (3 mark	(s)
	(b).	Describe "single-phasing" and state how it can be detected in 3-phase	motors. (5
marks phase marks	5) 5)	(c). With the aid of labeled diagram, explain the principle of operation induction motor.	of a 3- (12
Q5. (a).		State the main difference between induction motor and synchrous motor.	
		(5). Draw labeled diagrams to show three windings which are	marks)
		(i). Star connected (ii). Delta connected	(6
marks	5)		
	(c).	The input current to a 3 – phase step-down transformer connected to an supply system is 14A. Calculate the secondary line voltage and	11Kv current

star connection if the voltage transformation ratio is 44.

for star-

(9 marks)