

INTEGRAL COACH FACTORY::CHENNAI-38

Question Paper for selection of Assistant Electrical Engineer through Limited Departmental Competitive Examination.

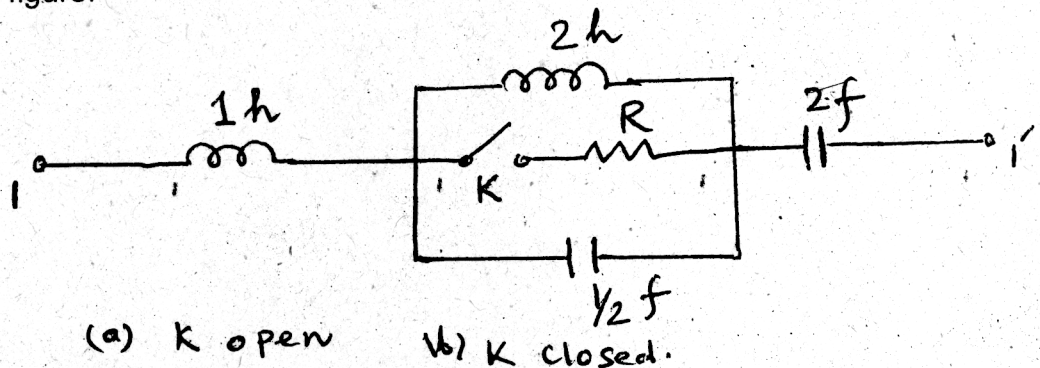
PAPER - I

Date: 08-09-08

Time: 3 hrs.
Max. Marks: 150

NOTE: Answer any **FIVE** questions. Each question carries 30 marks.

1. (a) Find out the values of $\sin 105$ and $\cos 15$ using formulae for \sin and \cos of sum/difference of angles.
- (b) Find the values of $\cos 105$ & $\sin 15$ using formulae for \sin and \cos of sum/difference of angles.
- (c) A & B are two complex numbers. $A = 3 + 2i$ and $B = 2 + 5i$. Work out $A+B$, $A-B$, $A \times B$, A/B
- (d) What is the differential of the following:
(i) $\sin x$, (ii) $\cos x$, (iii) $\tan x$, (iv) $\ln x$, (v) x^3
- (e) Compute the differential for each of the following:-
(a) $y = t^3 - 4t^2 - 7t$
(b) $w = x^2 \sin(2x)$
- (f) Answer the following:
(i) Compute the net work response of a LC series circuit having $L = 1 \text{ H}$ and $C = 1 \text{ Farad}$. Find the current $i(t)$ if the source is $\sin t$.
(ii) Find the driving point impedance of the net work shown in the figure. (6 x 5)



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2. (a) What is meant by armature reaction in dc machines? (7)
 (b) Show that the effect of armature m.m.f. on the main field is entirely cross magnetizing in the dc machines (7)
 (c) Show that in a dc machine under saturated conditions, the effect of armature m.m.f. is to de-magnetize the main field. (7)
 (d) What are the various methods to decrease the effect of armature reaction in a dc machine? Explain in brief. (9)

 3. (a) Develop the general phasor diagram for a cylindrical rotor alternator (10)
 (b) Explain how open circuit & short circuit tests are conducted on a synchronous machine. (5)
 (c) What is an air-gap line? In an alternator, explain why short circuit characteristics is a straight line whereas open circuit characteristics is a curve? (5)
 (d) Explain the two reaction theory as applied to salient pole synchronous machine and draw its phasor diagram for lagging power factor. (10)

 4. (a) A 3 Ph., 50 Hz Induction motor has a full load speed of 1440 rpm. Calculate the following for this machine.
 - (i) No. of poles, (2)
 - (ii) Full load slip & Rotor frequency (2)
 - (iii) Speed of stator field w.r.t. (a) stator structure, (b) rotor structure (6)
 - (iv) Speed of the rotor field w.r.t. (a) rotor structure, (b) stator structure, (c) stator field. (6)

 - (b) Develop the equivalent circuit of a polyphase induction motor. (14)

 5. (a) How can the polarity test be performed on a Single Phase 2 winding transformer. Which type of polarity is preferred in the transformer and why? (15)

 - (b) A 20 kVA, 2500/500 V Single Phase Transformer has the following parameters. (15)

H.V. Winding

$$R_1 = 8 \text{ ohms}$$

$$X_1 = 17 \text{ ohms}$$

L.V. Winding

$$R_2 = 0.3 \text{ ohms}$$

$$X_2 = 0.7 \text{ ohms}$$

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Find the voltage regulation and the secondary terminal voltage at full load for a power factor of 0.8 lagging and a power factor of 0.8 leading. The primary voltage is held constant at 2500 V.

6. Answer any five of the following:

(5 x 6)

- (a) Permanent magnet moving coil instrument
- (b) Classification of magnetic materials from magnetic point of view
- (c) Clean development mechanism w.r.t. Global warming
- (d) Provisions of Indian Electricity Act for energy conservation
- (e) Working of high pressure mercury vapour lamps
- (f) Measurement of resistance by means of a potentiometer
- (g) What are the conditions of parallel operation of Transformer? Which condition is essential without satisfying which transformer cannot be operated in parallel ?

7. Answer the following: (Each section carries 10 marks)

- I.
 - (a) Author of the Gulag Archipelago
 - (b) Headquarter of International Atomic Energy Commission
 - (c) Name the event and the person in which India won the gold medal in Olympics in an individual event.
 - (d) Name of the Chairman/Railway Board
 - (e) Secretary General of United Nations
 - (f) Name the Indian organization which shared the Nobel prize for peace in 2007 and the person who got the award.
 - (g) Expand the abbreviation UNFCC.
 - (h) Name the highest mountain peak in India
 - (i) Name the chancellor of Germany
 - (j) Who is known as the Nightingale of India ?
- II.
 - (a) What are the states coming under Region A, B & C? (4)
 - (b) What is the percentage of correspondence in Rajbasha to be done between the states coming under Region B & C? (3)
 - (c) What are the various incentives provided to employees for promotion of Rajbasha? (3)
- III. How can you use an induction motor as a frequency converter? Discuss in detail. (10)