Total No. of Questions : **08** Roll No. : 0701..

B.Tech SEVENTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-7311 (EL-I) GENERALISED THEORY OF MACHINES

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Explain the double revolving field theory as applied to a single phase induction motor. ***07***

(b) Explain how the equivalent circuit parameters of a single phase induction motor can be determined experimentally. State various assumptions made. ***07***

2(a) State and describe the methods of starting single phase induction motors. Explain, how a rotating field is produced in each one of them at the time of starting? ***07***

(b) A 2-pole, 50 Hz, single phase induction motor has an effective rotor resistance and standstill leakage reactance of 0.6 ohm and 1.0 ohm respectively. If the motor is running at 2700 rpm, then determine the frequencies of the two rotor current components and the relative magnitudes of the forward and back ward fluxes. Neglect magnetizing current and stator leakage impedance. ***07***

3(a) Derive expressions for the brush emfs produced by rotating field in case of commutator machines. ***07***

(b) Show with the help of phasor diagrams that a compensated series motor possesses better speed torque characteristics better p.f. operation and improved commutation as compared to an uncompensated series motor. ***07***

4(a) Explain the constructional features of a Schrage motor. How does it differ from an ordinary induction motor? ***07***

(b) A universal series motor has total resistance of 1.0 ohm and total inductance of 0.05H. When connected to 220 V d.c., the motor draws 10 A and runs at 1400 rpm. Calculate the speed and power factor when the motor draws the same current from 200V, 50Hz source. ***07***

5(a) With the help of a suitable diagram, describe the common essential features of rotating electrical machines. ***07***

(b) Write the voltage equations for Kron's primitive machine in matrix form. What observations are made from the impedance matrix of this machine? ***07***

6(a) In order to ensure power invariance in transforming one set of variables to another, show that the transpose of the transformation matrix should be equal to its inverse. ***07***

(b) Obtain identical transformation for currents and voltages from a rotating balanced 3-phase to (a,b,c) winding to a rotating balanced 2-phase (α,β) winding. Show that power invariance is maintained under this transformation. ***07***

7(a) Distinguish between X'_d, X''_d and between X'_q, X''_q parameters of a salient pole synchronous machine. Give the corresponding flux linkage diagrams. ***07***

(b) Explain how X_d, X'_d and X''_d can be determined from armature current oscillograms obtained after a sudden symmetrical 3-phase short circuit at the alternator terminals. ***07***

8(a) Explain the common problems concerning the dynamics of induction motors. ***07***

(b) What do you understand by the 'single phasing' of 3-phase induction motors? Explain how the operation of a 3-phase induction motor is affected when single phasing occurs. ***07***

*****

Total No. of Questions : **08** Roll No. : 0701...

B.Tech SEVENTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-7321 (EL-II) INDUSTRIAL ELECTRONICS AND DRIVES

Time : Three Hours *Maximum Marks : 70*
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) What is electrical drives? State and explain the essential components of electrical drives. ***07***

(b) A drive has following parameters : ***07***

T = 150 - 0.1N, N-m, where N is the speed in rpm.
Load torque = 100, N-m.

Initially the drive is operating in steady-state. The characteristics of the load torque are changed to = -100 N-m.

Calculate initial and final equilibrium speeds.

2(a) What are the main factors which decide the choice of electrical drive for a given application? ***07***

(b) A motor equipped with a flywheel is to supply a load torque of 1000 N-m for 10 seconds followed by a light load period of 200 N-m long enough for the flywheel to regain its steady-state speed. It is desired to limit the motor torque to 700 N-m. What should be the moment of inertia of flywheel? Motor has an inertia of 10 kg-m^2. Its no load speed is 500 rpm and the slip at a torque of 500 N-m is 5%. ***07***

3(a) Describe the step-by-step process to design an electrical drive for a particular industrial application. ***07***

(b) Explain the operation of microprocessor-controlled electrical drives with a neat block diagram. ***07***

4(a) Explain the four-quadrant operation of a chopper-controlled separately excited DC motor with neat circuit and output waveform diagrams. ***07***

(b) A 200 V, 1000 rpm, 150A separately excited dc motor has an armature resistance of 0.05 ohm. It is fed from a single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. Assuming continuous conduction, calculate :- ***07***

(i) firing angle for rated motor torque and 750 rpm,
(ii) firing angle for rated motor torque and -500 rpm.,
(iii) motor speed for firing angle = 160^o and rated torque.

5(a) Explain the operation of a three-phase induction motor drive using variable frequency control from a voltage source with neat V-f and speed-torque characteristics. ***07***

P.T.O.

5(b) Describe the operation of a self-controlled synchronous motor drive employing a cycloconverter with a neat circuit diagram. ***07***

6(a) State and explain the important features of various electrical braking methods of DC motors with circuit diagrams. ***07***

(b) Describe the first and third quadrants operation of a voltage source inverter-fed three-phase induction motor drive with a neat circuit diagram and speed-torque characteristics. ***07***

7(a) Describe the operation of a variable reluctance stepper motor with a neat circuit diagram. What is micro stepping? ***07***

(b) Describe the principle of operation of a switched reluctance motor drive with neat diagrams. What are the advantages of SRM over other AC motor drives? ***07***

8 Write short notes on **any two** : ***14***

Cycloconverter fed three-phase induction motor drives
Drive circuits for stepper motors
Slip power recovery schemes
Dual converter fed DC drive

*****

Total No. of Questions : **08** Roll No. : 0701.......................................

B.Tech SEVENTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-7304 POWER SYSTEM PROTECTION

Time : Three Hours

Maximum Marks : 70
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a)	Discuss essential and desirable qualities of good protective scheme.	*07*
(b)	What do you mean by 'reach' of protective device? What do you mean by 'Zone' in protective scheme?	*07*
2(a)	Discuss construction and operation of electromagnetic induction type relat.	*07*
(b)	What do you understand by 'PSM' and 'TMS' settings in an induction type over current relay? Discuss their mechanism.	*07*
3(a)	Explain and draw various operating characteristics of over current relays.	*07*
(b)	Discuss the operation and characteristics of directional relay. Give the specific application of it in power system protection.	*07*
4(a)	What do you mean by distance protection? Give torque equations and R-X characteristics of various types of distance relays.	*07*
(b)	What do you understand by current differential protection? How percentage biased protection scheme is superior than current differential protection?	*07*
5(a)	A 3-phase transformer rated for 400KV / 33KV is connected delta-star and the current transformers on the high voltage side have a ratio of 200/5. Determine the ratio of the current transformer on the LV side.	*07*
(b)	Explain with neat sketch, Buchholz relay protection for distribution transformer.	*07*
6(a)	Discuss negative sequence protection in large alternators.	*07*
(b)	Explain the construction and operation of the HRC Cartridge fuse. Compare circuit breaker with HRC fuse as current interrupting device.	*07*
7(a)	Derive an expression for restricking voltage and RRRV in terms of system capacitance and inductance.	*07*
(b)	For a 400 KV system, the reactance and capacitance up to the location of a C.B is 2Ω and 0.025 μF respectively. Calculate the frequency of transient oscillations and max value of RRRV.	*07*
8(a)	Discuss the construction and operation of Minimum oil circuit breaker. What are its advantages over bulk oil circuit breakers?	*07*
(b)	Write short notes on **any one** : (i) Current chopping in circuit breakers (ii) Arc Interruption Methods	*07*

*****

Total No. of Questions : **08** Roll No. : 0701......................................

B.Tech SEVENTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-7331 (OEL-III) RELIABILITY ENGINEERING

Time : Three Hours *Maximum Marks : 70*
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Differentiate between discrete random variable and continuous random variable with example. *07*

(b) Define the theory of probability and random variable with mathematical expression. *07*

2(a) Discuss the failure rate (both tub) curve for batch production. What are the causes of failures of any system? *07*

(b) Define the following : (i) Random exponent (ii) Sample space (iii) Random event. *07*

3(a) Define hazard rate and MTTF. Derive an expression of failure rate f(t) in terms of hazard rate z(t). *07*

(b) Explain the various method of reliability improvement and their effect on the system. *07*

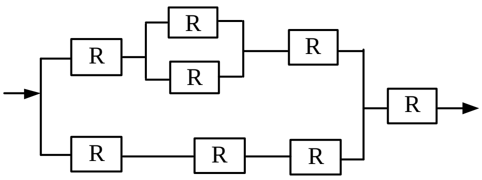
4(a) What is meant by redundancy? Differentiate clearly between component redundancy and system redundancy. *07*

(b) For a linear hazard rate model $Z(t) = bt > 0$, derive expression of R(t), f(t), MTTF. *07*

5(a) During the transport of a large number of electronics components the probability of 10 components received, determine the probability of : *07*

(i) Getting just two defective components,
(ii) Getting exactly six good components and
(iii) Five or more of them being good.

(b) Compute the system reliability if R = 0.8. *07*



6(a) The mean time to failure a particular type of component is 800 h. What is the probability that a similar component will fail in an operating time of : *07*

(i) 200 h (ii) 400 h and (iii) 100 h.

(b) Describe monte-carlo simulation technique. *07*

7(a) Draw the reliability model of four generation unit and mention rate and failure rate clearly. *07*

(b) Briefly describe reliability management in an industry. *07*

8 Write short notes on **any two** : *14*

(i) Component reliability and its impact on overall system reliability with mathematical expression
(ii) Reliability and safety
(iii) Monte-carlo method

*****