SEMESTER V

SLOT	COURSENO	COURSES	L-T-P	HOURS	CREDIT
A	EET301	POWERSYSTEMSI	3-1-0	4	4
B	EET303	MICROPROCESSORSAND MICROCONTROLLERS	3-1-0	4	4
C	EET305	SIGNALSANDSYSTEMS	3-1-0	4	4
D	EET307	SYNCHRONOUSANDINDUCTION MACHINES	3-1-0	4	4
E	HUT300	INDUSTRIALECONOMICS&FOREIGN TRADE	3-0-0	3	3
F	MCN301	DISASTERMANAGEMENT	2-0-0	2	--
S	EEL331	MICROPROCESSORSAND MICROCONTROLLERSLAB	0-0-3	3	2
T	EEL333	ELECTRICALMACHINESLABII	0-0-3	3	2
R/M/H	VAC	REMEDY	3-1-0	4*	4
TOTAL				**27/31**	**23/27**

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EET301	POWER SYSTEMS I	PCC	3	1	0	4

Preamble: The basic objective of this course is to deliver fundamental concepts in power system components. The basic principle of generation, transmission and distribution of electrical power is comprehensively covered in this course ranging extensively from the conventional ones to the modern discoveries. Deregulated systems in the smart grid and micro-grid with details of grid connected energy storages are also introduced to the students through this course.

Prerequisite : EET 201 Circuits and Networks

Course Outcomes : After the completion of the course the student will be able to:

CO 1	Identify the power generating system appropriate for a given area.
CO 2	Evaluate the electrical performance of any transmission line.
CO 3	Compute various physical characteristics of underground and overhead transmission systems.
CO 4	Select appropriate switchgear for protection schemes.
CO 5	Design a simple electrical distribution system as per the standards.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3					2		2			1	2
CO 2	3	3										
CO 3	3	2				2	2	2				
CO 4	3	1				2		2				1
CO 5	3	1				2	2	2			1	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10	10	20
Understand (K2)	10	10	20
Apply (K3)	30	30	60
Analyse (K4)	-	-	-
Evaluate (K5)	-	-	-
Create (K6)	-	-	-

End Semester Examination Pattern : There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What are the methods employed for improving the efficiency of thermal power plant? (K1, K2)
2. How does diversity factor decide the capacity of a power station? (K2)
3. What are the limiting factors in tapping the wind and solar potential?(K2)
4. Problem to calculate the specification of ground mounted or rooftop solar plants. (K3)

Course Outcome 2 (CO2):

1. Explain the principle and causes of proximity effect and Ferranti effect using appropriate figures (K2)
2. What is transposition of lines? Comment on its necessity in the system. (K2)
3. Problems in Transmission line modelling and analysis.(K3)

Course Outcome 3 (CO3):

1. What are the critical voltages in the formation of Corona? What is the effect of Corona? (K1, K2).
2. With a neat cross sectional view show the constructional features of an EHT Cable. (K2).
3. Problems due to sag/ corona/insulators. (K3)

Course Outcome 4 (CO4):

1. What are the essential qualities required by any insulating medium used for arc quenching? What are the usual insulating media used? (K2)
2. What is current chopping? What is its effect on the system? (K1,K2).
3. What makes the differential protection very significant in the protection schemes of electrical machines and transformers?(K2)
4. Problems in Arc interruption (K3).

Course Outcome 5 (CO5):

1. Derive the equations for voltage drop and current loss in a two wire ring main distributor supplied by (i) DC and (ii) AC Voltages. (K3).
2. How does power factor affect an HT consumer's electricity bill? (K2).
3. Problems in power factor improvement (K3).

Model Question paper

QP CODE:

PAGES:4

Reg.No:_____
Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION,
MONTH & YEAR

Course Code: EET 301

Course Name: POWER SYSTEMS I

Max. Marks: 100 Duration: 3 Hours

PART A (3 x 10 = 30 Marks)

Answer all Questions. Each question carries 3 Marks

1. Draw the block diagram of wind power generation and label each part clearly.
2. Discuss the difference between conventional electric power grid and smart grid
3. Draw the possible configurations for a three phase double circuit transposed line system.
4. Derive the deviation in sag due to ice in a winter climate.
5. What is meant by the term grading associated with insulators? Why is it very significant?
6. Discuss the classification of series and shunt FACTS devices.
7. Derive the peak value of current due to capacitive current chopping.
8. With the help of a schematic, explain the architecture of an IEC61850 enabled substation architecture
9. Write notes on energy markets.
10. Calculate the voltage drop and power loss for a radial load of 120A, 0.8 pf lag supplied by a 6.6kV three phase system with a branch impedance of 2 +j2 ohms.

PART B (14 x 5 = 70 Marks)
Answer any one full question from each module. Each question carries 14 Marks

Module 1

11. a) A proposed station has the following load cycle:
Time in hours: 6-8 8-11 11-16 16-19 19-22 22-24 24-6
Load in MW: 20 40 50 35 70 40 20
Draw the load curve and select suitable generator units from 10,000, 20,000, 25,000, 30,000 kVA. Prepare the operation schedule for the selected machines and determine the load factor from the curve. **(5)**

b) State Skin Effect and Ferranti Effect and elucidate them with necessary diagrams. **(5)**

c) Enlighten upon the various components and their operation in a hydroelectric power plant for energy production. **(4)**

12. a)A generating station has the following maximum loads: 16000kW, 12000kW, 10000kW, 7000kW and 800kW. The annual load factor is 50%. Calculate the diversity factor and annual energy consumption if the maximum demand on the station is noted as 24000. **(5)**

b)With a neat sketch explain the principle of working of a Thermal Power Station. **(5)**

c)What are the limiting factors in tapping the wind and solar potential? **(4)**

Module 2

13. a)Derive the expression for capacitance in a single phase overhead line under the influence of earth effect. **(5)**

b)Classify transmission lines according to their length and enlist the line models. Derive the ABCD constants for medium lines using nominal π method. **(5)**

c) Following results are obtained by making experiments on three phase, three core metal sheathed cable. (i) Capacitance between all the three bunched conductors and sheath is 1.2 micro Farad. (ii) Capacitance between any one conductor and sheath and the other two being insulated is 0.8 micro Farad. (iii) Calculate the capacitance between any two conductors when the third conductor is connected to the sheath. **(4)**

14. a) An 80 km long transmission line has a series impedance of (0.15+j0.75) ohm per km and a shunt admittance of j5.1 x 10^{-6} ohm per km. Find the A, B, C, D parameters by Nominal π method. **(7)**

b) Derive the inductance of a single phase transmission line with three conductors arranged vertically in Side A and two conductors in Side B. The distance between adjacent conductors in each Side is 6m and that between the sides are 8m. Each conductor is of radius 0.3cm. **(7)**

Module 3

15. a)A transmission line conductor at a river crossing is supported from two towers at a height of 45m and 75m above the water level. The span length is 300m. Weight of the conductor is 0.85kg/mm. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 2050kg. **(5)**

b) Illustrate the methods used for improving string efficiency of overhead line insulators using appropriate figures and equations. **(5)**

c) Surge impedance loading is a key parameter of any power system. Why? **(4)**

16. a) Explain the advantages and disadvantages of corona. **(4)**

b) (i) A single core, lead sheathed cable is graded by using three dielectrics of permittivity 6, 5 and 4 respectively. The conductor diameter is 2.5cm and overall diameter is 7cm. If the dielectrics are worked at the maximum stress of 38kV/cm, find the safe working voltage of the cable. **(5)**

(ii) What will be the value of safe working voltage for the same core and outside diameter assuming the same maximum stress? (ii) What should be the intersheath voltage, if the taps are provided at the same diameters as in Case (i) with a dielectric of permittivity 5, for the same maximum working stress? **(5)**

Module 4

17. a) With a neat sketch explain the principle of operation of an Vacuum Circuit Breaker **(4)**

b)What are the primary causes of overvoltages? How are the equipments protected from overvoltages? **(5)**

c)Explain the principle of operation of a static overcurrent relay. **(5)**

18. a)In a short circuit test on a 132kV three phase system, the breaker gave the following result: power factor of the fault =0.6, recovery voltage 0.97of full line value; the breaking current is symmetrical and the re-striking transient had a natural frequency of 16kHz. Determine the rate of rise of re-striking voltage. Assume that the fault is grounded. **(5)**

b)Explain the significant features of a Microprocessor based relay. **(5)**

c) What makes the differential protection very significant in the protection schemes of electrical machines and transformers? **(4)**

Module 5

19. a) Derive the equations for voltage drop and current loss in a two wire ring main distributor supplied by (i) DC and (ii) AC Voltages. **(5)**

b)What are the modern practices in distribution system? **(4)**

c)How do you justify the connection of capacitors for the improvement of power factor economically? Explain with a real life example. **(5)**

20. a) State the main types of distribution systems and compare their applications. **(3)**

b) Derivemost economical power factor for constant kW load & constant kVA type loads? **(7)**

c) A 3-phase, 5 kW induction motor has a power factor of 0.85 lagging. A bank of capacitor is connected in delta across the supply terminal and power factor raised to 0.95 lagging. Determine the kVAR rating of the capacitor in each phase? **(4)**

Syllabus

Module I (9 Hours)

Power System evolution–Load curve -Load factor, diversity factor, Load curve (brief description only) - Numerical Problems.
Generation-conventional (block schematic details, special features, environmental and ethical factors, advantages, disadvantages) -hydro, thermal, nuclear –renewable energy(block schematic details, special features, environmental factors, regulations, advantages, disadvantages) –solar and wind –Design of a rooftop/ground mounted solar farm (concepts only) – Energy storage systems as alternative energy sources- grid storage systems- bulk power grids –smart grids – micro grids.

Module II (10 hours)

Power Transmission System(Electrical Model)-Line parameters -resistance- inductanceand capacitance (Derivation of three phase double circuit) - Transmission line modelling-classifications -short line, medium line, long line- transmission line as two port network-parameters- derivation and calculations

Module III (10 hours)

Power Transmission System Calculation of Sag and tension-Insulators –string efficiency-grading–corona-Characteristics of transmission lines-Surge Impedance Loading- Series and shunt compensation.
Underground cables-ratings- classification- Capacitance –grading-testing
Introduction to EHVAC, HVDC and FACTS: Principle, classification and advantages/disadvantages

Module IV (12 hours)

Switchgear: Need for protection-circuit breakers-rating- SF6,VCB – Principle of GIS-protective relays – Demonstration of a typical electromechanical relay - Static, Microprocessor and Numeric types –Principles of overcurrent, directional, distance and differential- Types of protection schemes (Numeric relays) - causes of over voltages– Insulation co-ordination- Communication:PLCC - Fibre Optic-Introduction to IEC61850.

Module V (7 hours)

Power Distribution Systems– Distribution systems- Aerial Bunched Cables -Insulated conductors- Network standards-Earthing- transformer location – balancing of loads.
Methods of power factor improvement using capacitors- Tariff mechanisms– Introduction to energy markets (regulated and deregulated systems) -Distribution Automationsystems

Practical Exposure: Visit to a local Substation or a nearby power generating station, visit to a site of solar installation-Evaluation by a Viva

References:

1. Cotton H. and H. Barber, *Transmission & Distribution of Electrical Energy*, 3/e, Hodder and Stoughton, 1978.
2. Gupta J.B., Transmission *& Distribution of Electrical Power*, S.K. Kataria& Sons, 2009.
3. Kothari D. P. and I. J. Nagrath, *Power System Engineering*, McGraw Hill, 3rd Edition, 2019
4. Soni, M.L., P. V. Gupta and U. S. Bhatnagar, *A Course in Electrical Power*, DhanpatRai& Sons, New Delhi, 1984.
5. Stevenson W. D., *Elements of Power System Analysis*, 4/e, McGraw Hill, 1982.
6. Uppal S. L. and S. Rao, *Electrical Power Systems*, Khanna Publishers, 2009.
7. Wadhwa C. L., *Electrical Power Systems*, 33/e, New Age International, 2009.
8. Weedy B. M., B. J. Cory, N. Jenkins, J. B. Ekanayake and G. Strbac, *Electric Power System*, John Wiley & Sons, 2012.
9. O. I. Elgerd, *Electric Energy Systems Theory*, McGraw Hill, 1995.
10. John J. Grainger and William D. Stevenson, *Power System Analysis,*McGraw Hill, 1994.
11. IEC 61850 Communication Protocol Manual.
12. IEEE 1547 and 2030 Standards.
13. IEC 61724-1:2017 Performance of Solar Power Plants.
14. Dhirendra Kumar Tyagi, *Design, Installation and Operation of Solar PV Plants,* Published by Walnut Publication, Bhubaneswar, India, January 2019.
15. Souraph Kumar Rajput, *SOLAR ENERGY – Fundamentals, Economic and Energy Analysis,* NITRA Publication, 2017.
16. AS Kapur, *A Practical Guide for Total Engineering of MW capacity Solar PV Power Project*, White Falcon Publishing, 2015.
17. Joshua Eranest, Tore Wizelius, *Wind Power Plants and Project Development,* PHI Learning Pvt. Ltd., 2011.
18. G S Sawhney, *Non-Conventional Resources of Energy,* PHI Learning Pvt. Ltd., 2012
19. Arun G Phadke, James S Thorp, *Computer Relaying for Power Systems,* Wiley Publications, 2009.
20. JanakaEkanayake, KithsiriLiyanageJianzhong Wu, Akihiko Yokoyama and Nick Jenkins, *Smart Grid: Technology and Applications*, Print ISBN:9780470974094 |Online ISBN:9781119968696 |DOI:10.1002/9781119968696, John Wiley & Sons, Ltd, 2012.
21. Badri Ram and D. N. Viswakarma, *Power System Protection and Switchgear*, 2/e, Tata McGraw Hill Publication, 2011.
22. A. S. Pabla, *Electric Power Distribution*, 6/e, Tata McGraw Hill Publication, 2011 (or 5/e 2004).

Course Contents and Lecture Schedule:

No	Topic	No. of Lectures
1	**Power System evolution and Generation (9 hours)**	
1.1	Power System evolution- Load curve- Economic factors - Numerical Problems.	2
1.2	Hydroelectric -Thermal and Nuclear power plant- (Block schematic details, special features, environmental and ethical factors, advantages, disadvantages)	2
1.3	Nonconventional energy sources-Wind farm –(Block schematic details, special features, environmental factors, regulations, advantages, disadvantages).	1
1.4	Renewable energy sources – Solar–(Block schematic details, special features, environmental factors, regulations, advantages, disadvantages) - Design of a rooftop– Design of a ground mounted solar farm	2
1.5	Energy storage systems as alternate energy sources- Grid Storage systems - Bulk power grids - micro-grids	2
2	**Power Transmission System(Electrical Model)(10 hours)**	
2.1	Line parameters -resistance- inductance and capacitance (Derivation of single phase, three phase, single circuit and double circuit) - Numerical Problems.	5
2.2	Transmission line modelling- classifications -short line, medium line, long line-models- Transmission line as two port network-ABCD parameters- derivation and calculations- Numerical Problems.	5
3	**Power Transmission (Physical Aspects)(10 Hours)**	
3.1	Calculation of Sag and tension- Numerical Problems.	2
3.2	Insulators –string efficiency- grading- Numerical Problems.	2
3.3	Corona- Numerical Problems.	1
3.4	Surge Impedance Loading- Series and shunt compensation- Principle only.	1
3.5	Underground cables-ratings- classification- Capacitance –grading-testing- Numerical Problems.	2
3.6	Introduction to EHVAC, HVDC and FACTS: Principle, classification and advantages/disadvantages	2

4	**Switchgear (12 Hours)**	
4.1	Need for protection-formation of arc-Arc quenching theory- Restriking Voltage-Recovery voltage, RRRV - Interruption of Capacitive currents and current chopping (Numerical Problems) Circuit breakers-rating- SF6,VCB- (Diagram, construction, working, advantages, disadvantages) - Principle of GIS	3
4.2	Protective relays –Demonstration of a typical electromechanical relay - Static-Comparison and duality of Amplitude and Phase comparators-(Circuit Diagram, working, advantages, disadvantages) Microprocessor -(Flow Chart, working, advantages, disadvantages) and Numeric-(Block Diagram, working, advantages, disadvantages) Overcurrent, directional, distance and differential-(Principle, circuit diagram) Types of protection schemes (Using Numeric relays)	6
4.3	Causes of over voltages–Surge Protection	1
4.4	Transmission System -Communication- Fibre Optic - Abstract ideas only)	1
4.5	Introduction to IEC 61850	1
5	**Power Distribution Systems(7 Hours)**	
5.1	Distribution systems- DC and AC distribution: Types of distributors- bus bar arrangement-Numerical problems. Aerial Bunched Cables -Insulated conductors-(Abstract ideas only)	2
5.2	Network-standards -Earthing- transformer location – balancing of loads-(Abstract ideas only)	2
5.3	Tariff – regulated and deregulated systems- Numerical Problems	1
5.4	Methods of power factor improvement using capacitors- Numerical Problems	1
5.5	Distribution Automation systems	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EET303	MICROPROCESSORS AND MICROCONTROLLERS	PCC	3	1	0	4

Preamble: This course helps the students to understand 8085 microprocessor and 8051 microcontroller architecture as well as to design hardware interfacing circuit. This also aids to thrive their programming skills to solve real world problems.

Prerequisite: Fundamentals of Digital Electronics, C Programming

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Describe the architecture and timing diagram of 8085 microprocessor.
CO 2	Develop assembly language programs in 8085 microprocessor.
CO 3	Identify the different ways of interfacing memory and I/O with 8085 microprocessor.
CO 4	Understand the architecture of 8051 microcontroller and embedded systems.
CO 5	Develop assembly level and embedded C programs in 8051 microcontroller.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2										
CO 2	3	2	3	2	1							
CO 3	3	2	2	2	2							
CO 4	3	2										
CO 5	3	2	3	2	1	1						1

Assessment Pattern:

Total Marks	CIE marks	ESE marks	ESE Duration
150	50	100	03 Hrs

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10	10	20
Understand (K2)	10	10	20
Apply (K3)	30	30	60

Analyse (K4)			
Evaluate (K5)			
Create (K6)			

End Semester Examination Pattern : There will be two parts; Part A and Part B. **Part A** contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions.
Part B contains 2 questions from each module of which student should answer any one. Each question carries 14 marks and can have maximum 2 sub-divisions.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the register organization in 8085 microprocessor.
2. Explain the Stack and subroutine operations.
3. Explain the basic steps involved in accessing memory locations.
4. Draw the timing diagrams of different instructions of 8085 microprocessor.

Course Outcome 2 (CO2):

1. Describe the addressing modes of 8085 microprocessor.
2. Describe the various types of 8085 microprocessor instructions.
3. Explain in detail the instruction set of 8085 microprocessor.
4. Write an ALP for data transfer, arithmetic, logical and branching operations.

Course Outcome 3(CO3):

1. Explain how RAM and ROM memory are interfaced with 8085 microprocessor.
2. Describe address decoding used in I/O interfacing.
3. Explain the architecture of 8255 PPI.
4. Explain the modes of operation of 8255 PPI.

Course Outcome 4 (CO4):

1. Explain the special function registers in 8051 microcontroller.
2. Explain the operating modes of serial port of 8051 microcontroller.
3. Describe the addressing modes and modes of operation of timer of 8051 microcontroller.
4. Explain the embedded C Programming.

Course Outcome 5 (CO5):

1. Explain timer programming in assembly language and embedded C.
2. Explain serial port programming in assembly language and embedded C.
3. How to interface ADC, DAC and sensors with 8051 microcontroller.
4. Explain interrupt programming in assembly language and C.

Model Question Paper

QP Code: Pages: 2

Reg No: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION,
MONTH & YEAR

Course Code: EET303
Course Name: MICROPROCESSORS AND MICROCONTROLLERS

Max. Marks: 100 Duration: 3 Hours

PART A
Answer all Questions. Each question carries 3 Marks

1. Explain the use of ALE signal in Intel 8085 microprocessor.
2. Describe the use of CLK OUT and RESET OUT signals.
3. With the help of an example explain the operation of XTHL instruction.
4. How can we check the status of flags in 8085 microprocessor?
5. Explain software and hardware interrupts.
6. Write the differences between microprocessor and microcontroller.
7. Draw the block diagram of 8051 microcontroller.
8. Explain the bit pattern of TMOD register of 8051 microcontroller.
9. How we can enable and disable interrupts in 8051 microcontroller.
10. Find the bits of TMOD registers to operate as timers in the following modes
    (i) Mode 1 Timer (ii) Mode 2 Timer 0.

PART B
Answer any one full question from each module. Each question carries 14 Marks

Module 1

11. (a) Explain the functional block diagram of 8085 microprocessor. **(10)**
    (b) Define machine cycle and T state. **(4)**
12. (a) Sketch and explain the timing diagram of LDA 2003H. **(10)**
    (b) Describe the addressing modes of 8085 microprocessor. **(4)**

Module 2

13. (a) Write an ALP to sort an array of 10 numbers stored from memory location 2001H onwards in ascending order. **(10)**

    (b) Explain stack related operations in 8085 microprocessor. **(4)**

14. (a) Write a delay program to introduce a delay of 1 second. **(8)**

    (b) Explain the operation of DAA instruction in 8085 microprocessor. **(6)**

Module 3

15. (a) Explain the address decoding technique in memory interfacing. **(8)**

    (b) Give the control word format for BSR and I/O Mode in 8255. **(6)**

16. (a) Explain the architecture of 8051 microcontroller. **(8)**

    (b) Explain hard and soft real time systems. **(6)**

Module 4

17. (a) Explain the different methods to create a time delay in 8051 microcontroller. **(7)**

    (b) Explain the different addressing modes of 8051 microcontroller? **(7)**

18. (a) Explain the various types of instructions in 8051 microcontroller? **(6)**

    (b) Write a Program in 8051 for the generation of square wave having a duty ratio of 0.5 for a time period of 1ms. **(8)**

Module 5

19. (a) Explain how a DAC can be interfaced to 8051 microcontroller. **(10)**

    (b) Explain the role of SBUF and SCON registers used in 8051 microcontroller. **(4)**

20. (a) Describe the generation of time delay using the timer of 8051 microcontroller. **(8)**

    (b) Explain the various interrupts in 8051 microcontroller. **(6)**

Syllabus

Module 1

Internal architecture of 8085 microprocessor–Functional block diagram

Instruction set-Addressing modes - Classification of instructions - Status flags.

Machine cycles and T states – Fetch and execute cycles- Timing diagram for instruction and data flow.

Module 2

Introduction to assembly language programming- Data transfer operations, arithmetic operations, logic operations, branching operations, I/O and machine control operations.

Assembly language programmes (ALP) in 8085 microprocessor- Data handling/Data transfer, Arithmetic operations, Code conversion- BCD to Binary - Binary to BCD, Sorting - Ascending and descending including bubble sorting.

Stack and subroutines – Conditional CALL and Return instructions

Time delay subroutines using 8 bit register, 16 bit register pair and Nested loop control.

Module 3

Interrupt & interrupt handling - Hardware and Software interrupts.

I/O and memory interfacing – Address decoding– Interfacing I/O ports -Programmable Peripheral Interface PPI 8255 - Modes of operation- Interfacing of seven segment LED.

Introduction to embedded systems, Current trends and challenges, Applications of embedded systems- Hard and soft real time systems.

Introduction to microcontrollers- Microprocessor Vs Microcontroller- 8051 Microcontrollers – Hardware - Microcontroller architecture and programming model - I/O port structure - Register organization -General purpose RAM - Bit addressable RAM - Special Function Registers (SFRs).

Module 4

Instruction set - Instruction types - Addressing modes of 8051 microcontrollers.

8051 microcontroller data types and directives - Time delay programmes and I/O port programming.

Introduction to embedded C Programming - time delay in C - I/O port programming in embedded C.

Module 5

8051 Timer/counter programming - Serial port programming - Interrupt programming in assembly language and embedded C.

Interfacing –ADC - DAC and temperature sensor

Text Books

1. Ramesh Gaonkar, "Microprocessor Architecture Programming and Applications", Penram International Publishing; Sixth edition, 2014.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, "The 8051 microcontroller and embedded systems using Assembly and C", second edition, Pearson/Prentice hall of India.
3. Kenneth J. Ayala, "The 8051 microcontroller", 3rd edition, Cengage Learning, 2010
4. Lyla B Das, "Embedded Systems - An Integrated Approach", Pearson Education India

Reference Books

1. B Ram, "Fundamentals of Microprocessors and Microcontrollers", 9e, DhanpatRai Publications, 2019.
2. Wadhwa, "Microprocessor 8085 microprocessor: Architecture, Programming and Interfacing", PHI 2010
3. Shibu K V, "Introduction to Embedded systems", TMH

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Architecture and Instruction set of 8085 microprocessor (9 hours)**	
1.1	Internal architecture of 8085 microprocessor– functional block diagram	2
1.2	Instruction set- Addressing modes, Classification of instructions - Status flags.	4
1.3	Machine cycles and T states – Fetch and execute cycles - timing diagram for instruction and data flow.	3
2	**Assembly language programming (9 hours)**	
2.1	Introduction to assembly language programming- data transfer operations, arithmetic operations, logic operations, branching operations, I/O and machine control operations.	2
2.2	Assembly language programmes (ALP) in 8085 microprocessor-Data handling/Data transfer - Arithmetic operations - Code conversion - BCD to Binary - Binary to BCD, Sorting - Ascending and descending including bubble sorting.	4

2.3	Stack and subroutines – Conditional call and return instructions – Stack operations.	2
2.4	Time delay subroutines using 8bit register, 16 bit register pair and Nested loop control.	1
3	**Interfacing circuits for 8085 microprocessor and introduction to 8051 Microcontroller (10 hours)**	
3.1	Interrupt and interrupt handling - Hardware and Software interrupts.	1
3.2	I/O and memory interfacing – Address decoding – Interfacing I/O ports-Programmable peripheral interface PPI 8255 - Modes of operation -Interfacing of seven segment LED.	4
3.3	Introduction to embedded systems - Current trends and challenges - Applications of embedded systems - Hard and Soft real time systems.	1
3.4	Introduction to microcontrollers - Microprocessor Vs Microcontroller - 8051- Microcontrollers - Hardware	1
3.5	Microcontroller Architecture and programming model: I/O Port structure - Register organization - General purpose RAM -Bit Addressable RAM -Special Function Registers (SFRs).	3
4	**Programming of 8051 Microcontroller (9 hours)**	
4.1	Instruction Set - Instruction Types - Addressing modes	3
4.2	8051- Data types and directives -Time delay programmes and I/O port programming.	3
4.3	Introduction to embedded C Programming - Time delay in C - I/O port programming in embedded C.	3
5	**Interfacing circuits of 8051 Microcontroller (9 hours)**	
5.1	Timer/counter programming in assembly language and embedded C	3
5.2	Serial port programming in assembly language and embedded C	2
5.3	Interrupt programming in assembly language and embedded C	2
5.4	Interfacing –ADC - DAC and temperature sensor	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EET305	SIGNALS AND SYSTEMS	PCC	3	1	0	4

Preamble : This course introduces the concept of signals and systems. The time domain and frequency domain representation, operations and analysis of both the continuous time and discrete time systems are discussed. The application of Fourier analysis, Laplace Transform and Z-Transforms are included. Stability analysis of continuous time systems and discrete time systems are also introduced.

Prerequisite : **Basics of Circuits and Networks**

Course Outcomes : After the completion of the course the student will be able to:

CO 1	Explain the basic operations on signals and systems.
CO 2	Apply Fourier Series and Fourier Transform concepts for continuous time signals.
CO 3	Analyse the continuous time systems with Laplace Transform.
CO 4	Analyse the discrete time system using Z Transform.
CO 5	Apply Fourier Series and Fourier Transform concepts for Discrete time domain.
CO 6	Describe the concept of stability of continuous time systems and sampled data systems.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	-	-	2	-	-	-	-	-	-	1
CO 2	3	3	3	-	-	-	-	-	-	-	-	1
CO 3	3	3	3	-	2	-	-	-	-	-	-	2
CO 4	3	3	3	-	2	-	-	-	-	-	-	2
CO 5	3	3	3	-	-	-	-	-	-	-	-	2
CO 6	3	3	-	-	2	-	-	-	-	-	-	1

Assessment Pattern:

Total Marks	CIE marks	ESE marks	ESE Duration
150	50	100	03 Hrs

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10	10	20
Understand (K2)	10	10	20
Apply (K3)	30	30	60
Analyse (K4)			
Evaluate (K5)			
Create (K6)			

End Semester Examination Pattern : There will be two parts; Part A and Part B. **Part A** contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions.
Part B contains 2 questions from each module of which student should answer any one. Each question carries 14 marks and can have maximum 2 sub-divisions.

Course Level Assessment Questions :

Course Outcome 1 (CO1)

1. What are the standard test signals?
2. Problems related to various operations of signals.
3. Problems related to representation of systems in differential equation form.
4. Explain any three differences between linear and nonlinear systems.

Course Outcome 2 (CO2):

1. Problems related to Fourier series of continuous signals.
2. Problems related to Fourier transform of continuous systems.
3. Obtain the frequency response of the given system.

Course Outcome 3(CO3):

1. Derivations of transfer function of a given electrical system to comment on the system behaviour.
2. Problems related to analogous systems.
3. Problems related to block diagram reduction.

Course Outcome 4 (CO4):

1. Problems related ZIT.
2. Problems related to ZTF from difference equation form.
3. Problems related to block diagram development of ZTF of the given sampled system.

Course Outcome 5 (CO5):

1. Problems related to Discrete Fourier series of DT signals.
2. Problems related to Discrete time Fourier transform of DT signals
3. Obtain the frequency response of the given DT system.

Course Outcome 6 (CO6):

1. Problems related to the stability analysis of given continuous time systems using Routh criterion.
2. Problems related to stability analysis of DT systems.
3. Differentiate between asymptotic stability and BIBO stability?

Model Question Paper PAGES: 3

QPCODE:

Reg. No:_____

Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION

MONTH & YEAR

Course Code**: EET305**

Course Name: **SIGNALS AND SYSTEMS**

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1 Define unit ramp signal r(t). Sketch the signal r(-t+2).

2 Explain any two peculiar characteristics of nonlinear systems.

3 What are the conditions for the existence of Fourier transform?

4 Why do you use analogous systems? Explain with a suitable example.

5 Determine the unit impulse response for the system with $T(s) = \frac{2}{(s^2 + s - 12)}$

6 Explain the concept of positive real functions.

7 Explain the significance of ZOH circuit in signal reconstruction.

8 Write three properties of discrete convolution.

9 State and prove time reversal property of discrete time Fourier series.

10 Find the Fourier transform of x(n)= n u(n).

PART B

Answer any one full question from each module. Each question carries 14 Marks

Module 1

11 a) Check whether the following system is static, causal, linear and time invariant: $y(t) = |x(t)|$ **(8)**

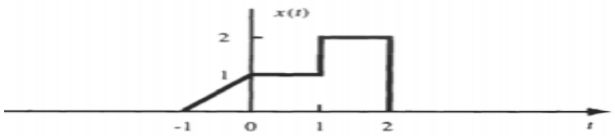
b) Find the convolution of $x_1(t)$ and $x_2(t)$ for the following signals: $x_1(t) = e^{-at}u(t); x_2(t) = e^{-bt}u(t)$ **(6)**

12 a) With suitable examples differentiate between:

i. Odd and even signals,

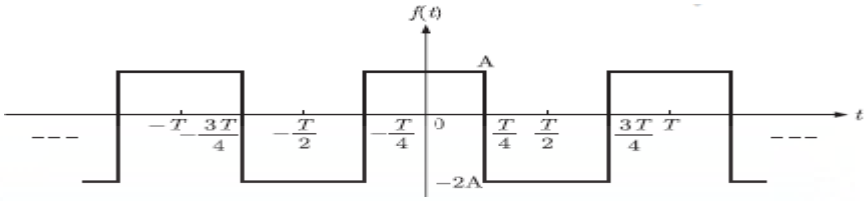
ii. Causal and non causal systems. **(7)**

b) The signal x(t) is given below. Plot x(t-1)+ x(-t+2) **(7)**



Module 2

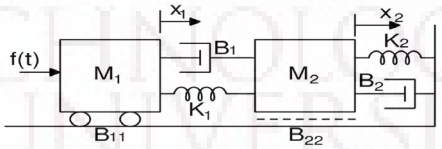
13 a) Find the trigonometric Fourier series for the periodic signal f(t).



(9)

b) State and prove time shifting property of Fourier transform. **(5)**

14 a) Derive the transfer function $X_2(s)/ F(s)$ for the mechanical



(7)

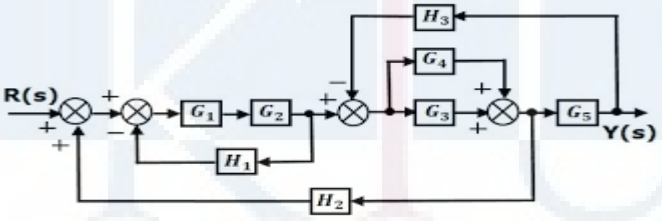
b) A system is described by the following differential equation:

$$\frac{d^2y(t)}{dt^2}+7\frac{dy(t)}{dt}+12y(t)=x(t);\ y(0^-)=-2,\frac{dy}{dt}(0^-)=0$$

Determine the response of the system to a unit step applied at t=0. **(7)**

Module 3

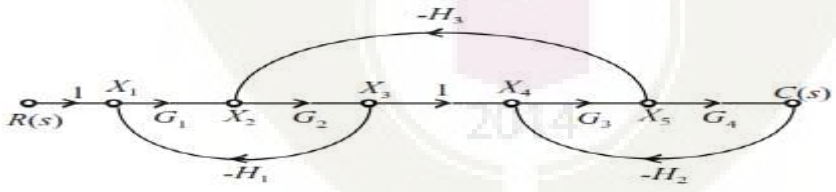
15 a) Determine the overall transfer function Y(s)/R(s) using block diagram reduction.



(8)

b) Check stability of the system represented by the following characteristic equation, using Routh stability criterion: $3s^4+10s^3+5s^2+5s+2=0$ **(6)**

16 a) Determine the transfer function of the system represented by the signal flow graph using Mason's gain formula.



(9)

b) How frequency response can be obtained from poles and zeros? **(5)**

Module 4

17 a) Determine the convolution sum of two sequences x(n)={1,4,3,2} and h(n)={1,3,2,1} using graphical method. **(8)**

b) Determine the z-transform of $x(n)=(1/2)^n u(-n)$. **(6)**

18 a) Explain the aliasing effect in sampled data systems. **(5)**

b) Determine the inverse z-transform of the following functions: $i)X(z)=\frac{2z^{-1}}{(1-\frac{1}{4}z^{-1})^2};ROC:|z|>\frac{1}{4},and,ii)F(z)=\frac{3z^{-1}}{(1-z^{-1})(1-2z^{-1})};ROC:|z|>2$ **(9)**

Module 5

19 a) Determine the complete solution of the difference equation: y (n) + 2y(n-1) + y(n-2) = x (n) + x(n-1) for the input x(n) = (0.5^n) u(n), initial conditions y(-1) = y(-2) = 1? **(9)**

b) Find the Fourier series coefficients for x(n)=cos(πn/4) **(5)**

20 a) i) Obtain the direct form-I realization for the system described by the difference equation: $y(n)-\frac{5}{6}y(n-1)+\frac{1}{6}y(n-2)=2x(n)$

ii) Also determine the impulse response h(n) for the above system. **(4+5)**

b) Check stability of the system described by the following characteristic equation, using Jury's test: z^3-0.2z^2-0.25z+0.05=0 **(5)**

Syllabus

Module 1

Introduction to Signals and Systems (9 hours):

Classification of signals: Elementary signals- Basic operations on continuous time and discrete time signals

Concept of system: Classification of systems- Properties of systems- Time invariance- Linearity -Causality – Memory- Stability-Convolution Integral- Impulse response

Representation of LTI systems: Differential equation representations of LTI systems

Basics of Non linear systems- types and properties

Introduction to random signals and processes (concepts only)

Module 2

Fourier Analysis and Laplace Transform Analysis (10 hours):

Fourier analysis of continuous time signals: Fourier Series- Harmonic analysis of common signals

Fourier transform: Existence- Properties of Continuous time Fourier transform- Energy spectral density and power spectral density

Concept of Frequency response

Laplace transform analysis of system transfer function: Relation between the transfer function and differential equation- Transfer function of LTI systems- Electrical, translational and rotational mechanical systems- Force voltage, Force current and Torque Voltage analogy

Module 3

System Models and Response (8 hours):

Block diagram representation - block diagram reduction

Signal flow graph - Mason's gain formula

Type and Order of the systems- Characteristic equation

Determining the time domain and frequency response from poles and zeros

Concepts of Positive real functions and Hurwitz polynomial- Routh stability criterion.

Simulation based analysis: Introduction to simulation tools like MATLAB/ SCILAB or equivalent for mathematical and signal operations (Demo/Assignment only)

Module 4

Sampled Data Systems and Z-Transform (9 hours):

Sampling process-Impulse train sampling-sampling theorem- Aliasing effect

Zero order and First order hold circuits- Signal reconstruction

Discrete convolution and its properties

Z Transform**:** Region of convergence- Properties of Z Transform

Inverse ZT: Methods

Module 5

Analysis of Sampled Data Systems (9 hours):

Difference equation representations of LTI systems - Analysis of difference equation of LTI systems- Z Transfer function- Delay operator and block diagram representation- Direct form, cascade and parallel representations of 2^{nd} order systems

Stability of sampled data system: Basic idea on stability- Jury's test- Use of bilinear transformation

Discrete Fourier series**:** Fourier representation of discrete time signals - Discrete Fourier series– properties.

Discrete Time Fourier Transform: Properties- Frequency response of simple DT systems

Text Books

1. Oppenheim A.V., Willsky A.S. & Nawab S.H., Signals and Systems, 2/e, Prentice Hall
2. Nagrarth I. J, Saran S. N and Ranjan R, Signals and Systems, 2/e, Tata McGraw Hill
3. Haykin S. & Veen B.V., Signals & Systems, 2/e, John Wiley
4. Nise N. S., Control Systems Engineering, 6/e, Wiley Eastern
5. Nagarath I. J. and Gopal M., Control System Engineering, 5/e, New Age Publishers

Reference Books

1. Bracewell R.N., Fourier Transform & Its Applications, McGraw Hill
2. Farooq Husain, Signals and Systems, Umesh publications.
3. Papoulis A., Fourier Integral & Its Applications, McGraw Hill
4. Taylor F.J., Principles of Signals & Systems, McGraw Hill

Course Contents and Lecture Schedule:

Module	Topic coverage	No. of Lectures
1	**Introduction to Signals and Systems (9 hours)**	
1.1	Classification of signals - Elementary signals- Basic operations on continuous time and discrete time signals	2
1.2	Concept of systems - Classification of systems- Properties of systems - Time invariance- Linearity -Causality – Memory- Stability.	2
1.3	Convolution Integral- Impulse response-	1
1.4	Representation of LTI systems - Differential equation representations of LTI systems	2
1.5	Basics of Non linear systems- types and properties Introduction to random signals and processes (concepts only)	2
2	**Fourier Analysis and Laplace Transform Analysis (10 hours)**	

2.1	Fourier Analysis of continuous time signals: Fourier Series- Harmonic analysis of common signals	2
2.2	Fourier transform: Existence- Properties of Continuous time Fourier transform- Energy spectral density and power spectral density	2
2.3	Concept of Frequency response- Frequency response of simple LTI systems.	2
2.4	Laplace transform analysis of system transfer function: Relation between the transfer function and differential equation	1
2.5	Transfer function of LTI systems: Electrical, Translational and rotational Mechanical systems	2
2.6	Force Voltage, Force Current and Torque Voltage analogy	1
3	**System Models and Response (8 hours)**	
3.1	Block diagram representation - block diagram reduction	2
3.2	Signal flow graph - Mason's gain formula	1
3.3	Type and Order of the systems- Characteristic equation.	1
3.4	Determining the time domain and frequency response from poles and zeros.	2
3.5	Concepts of Positive real functions and Hurwitz polynomial- Basic idea on Stability- Routh stability criterion	2
3.6	*Simulation based analysis: Introduction to simulation tools like MATLAB/ SCILAB or equivalent simulation software and tool boxes for various mathematical operations (Demo/Assignment only)*	
4	**Sampled Data Systems and Z-Transform (9 hours)**	
4.1	Sampling process-Impulse train sampling-sampling theorem- Aliasing effect	2
4.2	Zero order and First order hold circuits- Signal reconstruction-	2
4.3	Discrete convolution and its properties	1
4.4	Z Transform**:** Region of convergence- Properties of Z Transform	2
4.5	Inverse ZT: Methods	2
5	**Analysis of Sampled Data Systems (9 hours)**	
5.1	Difference equation representations of LTI systems - Analysis of difference equation of LTI systems- Z Transfer function	2
5.2	Delay operator and block diagram representation- Direct form, cascade and parallel representations of 2^{nd} order systems.	2
5.3	Stability of sampled data system: Basic idea on Stability- Jury's test- Use of bilinear transformation.	2
5.4	Discrete Fourier Series**:** Fourier representation of discrete time signals - Discrete Fourier series– properties	2
5.5	Discrete Time Fourier Transform: properties- Frequency response of simple DT systems	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EET307	SYNCHRONOUS AND INDUCTION MACHINES	PCC	3	1	0	4

Preamble: Nil

Prerequisite: DC Machines and Transformers

Course Outcomes: After the completion of the course, the student will be able to:

CO 1	Analyse the performance of different types of alternators.
CO 2	Analyse the performance of a synchronous motor.
CO 3	Analyse the performance of different types of induction motors.
CO 4	Describe operating principle of induction machine as generator.
CO 5	Explain the types of single phase induction motors and their working principle.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	-	-	-	2	-	-	-	-	-	2
CO 2	3	3	2	-	-	2	-	-	-	-	-	2
CO 3	3	3	2	-	-	2	-	-	-	-	-	2
CO 4	3	3	2	-	-	2	-	-	-	-	-	2
CO 5	2	2	-	-	-	2	-	-	-	-	-	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	20
Understand	15	15	30
Apply	25	25	50
Analyse			
Evaluate			
Create			

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions (each carrying 3 marks) with 2 questions from each module. Students should answer all questions. Part B contains 2 questions from each module, out of which students should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

Part A: 10 Questions x 3 marks=30 marks, **Part B:** 5 Questions x 14 marks =70 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the principle of operation of alternators.
2. List the advantages of stationary armature type alternators over rotating armature types.
3. Derive emf equation of an alternator.
4. Define coil pitch factor and distribution factor of an alternator.
5. Problems based on emf equation of alternators.
6. Draw the phasor diagram of an alternator operating under lagging/leading/unity power factor and hence derive an expression for the no load induced emf/phase.

Course Outcome 2 (CO2):

1. Why synchronous motors are not self starting?
2. Develop the equivalent circuit and phasor diagram of synchronous motor.
3. Explain the V and Inverted V curves of synchronous motor
4. Explain the power flow diagram of synchronous motor.

Course Outcome 3(CO3):

1. Explain the principle of operation of a three phase induction motor.
2. List the constructional differences between slip ring and squirrel cage induction motors.
3. Problems based on analysing the performance of three phase induction motors using circle diagrams.
4. Problems based on developing the equivalent circuit of a three phase induction motor.
5. Explain the various speed control methods of three phase induction motors.
6. Explain the working of DOL/Star-Delta starter for three phase induction motors.

Course Outcome 4 (CO4):

1. Explain the principle of operation of induction generator.
2. Explain the difference between Grid connected and self excited induction generators
3. Differentiate between induction generator and synchronous generator.
4. Enumerate application of induction generator.

Course Outcome 5 (CO5):

1. Why single phase induction motor is not self starting.
2. Explain double field revolving theory.
3. Draw the torque slip characteristics of single phase induction motor.
4. Develop the equivalent circuit of single phase induction motor.

Model Question paper

QP CODE:

PAGES:3

Reg.No:_____

Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION,
MONTH& YEAR

Course Code: EET307
Course Name: SYNCHRONOUS AND INDUCTION MACHINES

Max. Marks: 100 **Duration: 3 Hrs**

PART A

Answer all questions. Each Question Carries 3 marks

1. List the advantages of stationary armature type alternators over rotating armature types.
2. Define coil pitch factor and distribution factor of an alternator.
3. State and explain Blondel's Two Reaction Theory.
4. What is meant by synchronisation? Lit the conditions to be met while synchronising an alternator to the common bus bars.
5. With the help of neat figures, explain why a synchronous motor is not self-starting.
6. Differentiate between slip ring and squirrel cage induction motors.
7. Explain the phenomenon of crawling and cogging in induction motors.
8. Explain any two braking techniques of induction motors.
9. Differentiate between synchronous and induction generators.
10. What is double field revolving theory?

PART B

Answer any one full question from each module. Each question carries 14 marks.

Module 1

11. a) List the causes of harmonics in alternators and suggest ways to mitigate them. **(5)**

    b) A 3-Φ, 10 pole alternator has 2 slots/ pole/ phase on its stator with 10 conductors per slot. The air gap flux is sinusoidally distributed and equals 0.05 Wb. The stator has a double layer winding with a coil span of 1500. If the alternator is running at 600 rpm, calculate the emf generated /phase at no load. **(9)**

12. With the help of neat diagrams, explain the effects of armature reaction in alternators under lagging, leading and unity power factors. **(14)**

Module 2

13. A 220V, 6 pole, 50 Hz, star connected alternator gave the following test results: -

If (A)	0.2	0.4	0.6	0.8	1	1.2	1.4	1.8	2.2	2.6	3	3.4
Voc (line) (V)	29	58	87	116	146	172	194	232	261	284	300	310
Vzpf (line) (V)	-	-	-	-	-	0	29	88	140	177	208	230
Isc (A)	6.6	13.2	20	26.5	32.4	40	46.3	59	-	-	-	-

Find % voltage regulation at full load current of 40A at power factor 0.8 lag by (i) m.m.f method (ii) ZPF method. Ra=0.06 Ω /phase. **(14)**

14. a) Two 3Φ, 6.6 kV star connected alternators supply a load of 3000kW at 0.8 pflag. The synchronous impedance/phase of machine A is 0.5 + j 10 Ω and that of machine B is 0.4+j12 Ω. The excitation of machine A is adjusted so that it delivers 150 A at a lagging power factor and the governors are so set that the load is equally shared between the machines. Determine the current, power factor and induced emf of each machine. **(10)**

b)With the help of a neat circuit diagram, explain how an alternator is synchronised to the bus bars by bright lamp method. **(4)**

Module 3

15. a) With the help of a neat circuit diagram, explain how V and inverted V curves are obtained. **(6)**

b) A 2000V, 3-phase, 4 pole star connected synchronous motor runs at 1500 rpm. The excitation is constant and corresponds to an open circuit voltage of 2000V.The resistance is negligible compared to synchronous reactance of 3Ω per phase. Determine power input, power factor, torque developed for an armature current of 200A. **(8)**

16. a) In rice/flour mills driven by squirrel cage induction motors, the hopper is loaded with the grains only after starting the motor. Similarly, the delivery valve of centrifugal pumps driven by squirrel cage induction motor is opened only after starting the motor. What is the reason behind this? Justify your answer with a relevant performance curve of squirrel cage induction motor. **(4)**

b) A 6-pole, 50 Hz,3-Φ induction motor running on full load develops a useful torque of 150 Nm at a rotor frequency of 1.5 Hz. Calculate the shaft power output. If the mechanical torque lost in friction is 10 Nm, determine a) rotor copper loss b) input to the motor c) the efficiency. The total stator loss is 700W. **(10)**

Module 4

17. For the following test data, calculate (i) line current (ii) power factor (iii) rotor copper loss (iv) slip (v) efficiency (vi) maximum output power (vi) maximum torque and (vii) starting torque:

    Induction Motor Details: 3.73kW, 200V, 50Hz, 4pole, 3ϕ star connected
    No Load Test: 200V, 350W, 5A
    Blocked Rotor Test: 100V, 26A, 1700W
    Rotor Copper Loss at standstill is 60% of the total copper loss. **(14)**

18. Explain the methods of speed control in three phase induction motors. **(14)**

Module 5

19. a)Explain the working principle and modes of operation of an Induction Generator. **(8)**

    b) With the help of a neat figure, explain the torque-slip characteristics of an induction machine. **(6)**

20. Explain the working of split phase and capacitor start single phase induction motors with the help of neat circuit diagrams and phasor diagrams. Also mention the applications of each. **(14)**

Syllabus

Module 1

Principle of Operation of three phase alternators, Constructional features, Types of Armature Windings(detailed winding diagram not required), EMF equation, Numerical Problems.

Harmonics-causes, suppression, Rating of alternators, Parameters of armature winding, Armature reaction, Equivalent Circuit, Phasor Diagram, Load characteristics, Power Flow Equations.

Module 2

Voltage regulation of three phase Alternators-Direct loading, EMF Method, MMF Method, Potier Method,ASA Method -Numerical Problems.

Blondel's two reaction theory, Phasor Diagram under lagging power factor, Determination of X_d and X_q by slip test, Power developed by a Salient pole machine, Numerical Problems.

Parallel Operation of Alternators- Necessary Conditions, Synchronisation- Synchronising current, Power and Torque, Effect of reactance, Numerical Problems, Methods of Synchronisation.

Module 3

Principle of Synchronous Motor, Equivalent circuit, Phasor diagrams, Power flow diagram and equations, Losses and efficiency -Numerical Problems, Power-angle Characteristics, V Curve and Inverted V Curves.

Three phase Induction motor – Constructional features, Expressions for Power and Torque-Torque- Slip characteristics, Phasor diagram, Equivalent Circuit of Induction motor- Tests on Induction motors for determination of equivalent circuit-Numerical Problems.

Module 4

Performance of three phase Induction motors using Circle diagram, Numerical Problems. Cogging and Crawling in cage motors, Double cage Induction motor-Torque-Slip Characteristics.

Starting of Induction motors – Types of Starters – DOL starter, Autotransformer Starter, Star-Delta starter, Rotor Resistance Starter-Numerical Problems.

Braking of Induction motors – Plugging, Dynamic braking, Regenerative braking, Speed control – Stator Voltage control, V/f control, Rotor Resistance Control.

Module 5

Induction generator – Principle of operation, Grid Connected and Self Excited Operation of Induction Generators, Torque-Slip Characteristics of an Induction machine.

Single phase Induction motors-Double field revolving theory, Equivalent Circuit, Torque-Slip Characteristics, Types of Single Phase Induction motor, Applications.

Selection of AC motors for different applications.

Text Books

1. Bimbra P S, Electric Machines, Khanna Publishers, 2nd edition, 2017.
2. KothariD. P., NagrathI. J., Electric Machines, Tata McGraw Hill, 5th edition.2017.
3. Say M G, The Performance and Design of AC Machines, CBS Publishers, New Delhi, 3rd edition, 2002.
4. Alexander SLangsdorf, "Theory of Alternating Current Machinery", Tata McGraw Hill,2nd revised edition, 2001.

Reference Books

1. Deshpande M. V., Electrical Machines, Prentice Hall India, New Delhi, Eastern Economy Edition, 2011.
2. Gupta B R, VandanaSinghal, "Fundamentals of Electric Machines", New Age International,.2010.
3. Ashfaq Husain, HaroonAshfaq, Electric Machines, DhanpatRai and Co., 3rd edition,2002.
4. Gupta J B, "Theory and Performance of Electrical Machines", S K Kataria& Sons, 14th edition, 2013.

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Basics of Alternators (10 hours)**	
1.1	Principle of operation and classification of alternators, Synchronous speed.	2
1.2	Construction of synchronous machines. Salient and Cylindrical types, Turbogenerators. Stationary and Rotating armature types.	1
1.3	Armature windings-Types.: Single layer, Double layer, Full pitched winding, Short pitched winding, Concentrated and Distributed winding	1
1.4	EMF Equation, Pitch factor and Distribution factor, Numerical problems	3
1.5	Harmonics in Alternators: Space and slot harmonics, Suppression, Effect of pitch factor on harmonics.	1
1.6	Armature Reaction, Equivalent Circuit and Phasor Diagrams, Power Flow Equations	2
2	**Voltage Regulation and Synchronisation of Alternators (10 hours)**	
2.1	Voltage Regulation of Alternators: EMF, MMF, Potier and ASA Method.	4
2.2	Blondel's Two Reaction Theory, Phasor Diagram under lagging power	3

	factor based on two reaction theory,Slip Test	
2.3	Parallel Operation of Alternators, Necessity of Parallel Operation. Advantages.	1
2.4	Synchronisation of Alternators: Dark Lamp and Bright Lamp Method.	2
3	**Three Phase Synchronous and Induction Motors (10 hours)**	
3.1	Synchronous Motors-Principle, Equivalent Circuit, Phasor Diagrams, Power Flow Diagram, Power and Torque Equations, Numerical Problems	3
3.2	Effects of excitation on armature current and power factor- V and Inverted V Curves, advantages, disadvantages and applications of Synchronous motors.	1
3.3	Three phase Induction Motors-Principle, Constructional details, Slip ring and Cage types.	1
3.4	Slip,frequency and rotor current, Expression for torque and Power-Starting torque, Full load and Pull out torque, Torque- Slip characteristics, Phasor diagram.	3
3.5	Tests on Induction motors for determination of Equivalent circuit, Equivalent Circuit of Induction motor-Numerical Problems.	2
4	**Three Phase Induction Motors Contd. (8 hours)**	
4.1	Circle Diagram, Numerical Problems.	3
4.2	Cogging, Crawling–remedial measures, Double Cage Induction Motor-Principle.	1
4.3	Starters for three phase Induction Motors: DOL, Autotransformer, Star Delta and Rotor Resistance Starters.	2
4.4	Speed Control in Induction Motors	1
4.5	Braking in Induction Motors	1
5	**Induction Generators and Single Phase Induction Motors (7 hours)**	
5.1	Induction Generators: Grid Connected and Self Excited types.	1
5.2	Single phase induction motors-principle, Double field revolving theory, Torque-Slip characteristics, Applications	2
5.3	Types-Split phase, Capacitor Start, Capacitor Start and Run types, Shaded pole motor, Shaded Pole Motor-Principle of operation and applications.	3
5.4	Selection of AC motors for different Applications.	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EEL331	MICROPROCESSORS AND MICROCONTROLLERS LAB	PCC	0	0	3	2

Preamble : This laboratory course is designed to train the students to familiarize and program microprocessors and microcontrollers. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing embedded systems.

Prerequisite : Fundamentals of Digital Electronics and C programming

Course Outcomes : After the completion of the course the student will be able to

CO 1	Develop and execute assembly language programs for solving arithmetic and logical problems using microprocessor/microcontroller.
CO 2	Design and Implement systems with interfacing circuits for various applications.
CO 3	Execute projects as a team using microprocessor/microcontroller for real life applications.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	2	3	-	-	2	2	3	-	2
CO 2	3	3	2	2	3	-	-	2	2	3	-	2
CO 3	3	3	3	3	3	3	3	3	3	3	2	2

ASSESSMENT PATTERN:

Mark distribution:

Total Marks	CIE marks	ESE marks	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	Internal Test	Course Project	Total
15	30	25	5	**75**

Internal Test Evaluation (Immediately before the second series test)

End Semester Examination (ESE) Pattern:

The following guidelines should be followed regarding award of marks

(a) Preliminary work : 15 Marks

(b) Implementing the work/Conducting the experiment : 10 Marks

(c) Performance, result and inference (usage of equipments and trouble shooting) : 25 Marks

(d) Viva voce : 20 marks

(e) Record : 5 Marks

General instructions : Practical examination is to be conducted immediately after the second series test after conducting 12 experiments from the list of experiments given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

LIST OF EXPERIMENTS:

(12 experiments are mandatory)

8085 Microprocessor Programming

1. Data transfer using different addressing modes and block transfer.
2. (a) Arithmetic operations in binary and BCD: addition, subtraction, multiplication and division

   (b) Logical instructions- sorting of arrays in ascending and descending order.

   (c) Binary to BCD conversion and vice versa.

8051 Microcontroller Programming

3. ALP programming for

   (a) Data transfer: Block data movement, exchanging data, sorting, finding largest element in an array.

   (b) Arithmetic operations: Addition, subtraction, multiplication and division. Computation of square and cube of 16-bit numbers.

4. ALP programming for the implementation of counters: HEX up and down counters, BCD up/down counters

5. (a) ALP programming for implementing Boolean and logical instructions: bit manipulation.

   (b) ALP programming for implementing conditional call and return instructions: Toggle the bits of port 1 by sending the values 55H and AAH continuously, Factorial of a number

6. ALP programming for

   (a) Generation of delay

(b) Transmitting characters to a PC HyperTerminal using the serial port and displaying on the serial window

7. C Programs for stepper motor control.

8. C Programs for DC motor direction and speed control using PWM.

9. C Programs for Alphanumerical LCD panel/ keyboard interface.

10. C Programs for ADC interfacing.

11. Demo Experiments using 8085 Microprocessor Programming

(a) Digital I/O using PPI: square wave generation.

(b) Interfacing D/A converter- generation of simple waveforms-triangular, ramp etc.

(c) Interfacing A/D converter.

12. Demo Experiments using 8051 Microcontroller Programming

ALP programming for implementing code conversion– BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexadecimal to Decimal and Decimal to Hexadecimal.

13. a) Familiarization of Arduino IDE

b) LED blinking with different ON/OFF delay timings with i) inbuilt LED ii) Externally interfaced LED

14. Arduino based voltage measurement of 12V solar PV module/ 12V battery and displaying the measured value using I2C LCD display.

15. Arduino based DC current measurement using Hall-effect current sensor like LEM LA-55P sensor and displaying the value using I2C LCD module.

16. DC motor speed control using MOSFET driven by PWM signal from Arduino module.

17. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.

18. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

Mandatory Group Project Work **:** Students have to do a mandatory micro project (group size not more than 3 students) to realise an embedded system for Industrial Control/ day-to-day life applications. A report also is to be submitted. Performance can be evaluated along with the internal test and a maximum of 5 marks shall be awarded.

Example projects (Microcontroller based projects)

1. Temperature Monitoring and control System.
2. Home automation system
3. Remote health monitoring and emergency notification system
4. IoT based power monitoring
5. IoT based switching of power devices

Reference Books:

1. Ramesh Gaonkar, Microprocessor Architecture Programming and Applications, Penram International Publishing; Sixth edition, 2014.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi," The 8051 microcontroller and embedded systems using Assembly and C", second edition, Pearson/Prentice hall of India.
3. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010
4. Donald P. Leach, Albert Paul Malvino and Goutam Saha, Digital Principles and Applications, 8/e, by McGraw Hill.
5. A. P. Mathur, Introduction to Microprocessors, Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Jeeva Jose, Internet of Things, Khanna Publishing House, Delhi
7. Raj Kamal, Internet of Things: Architecture and Design, McGraw Hill

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EEL333	ELECTRICAL MACHINES LAB II	PCC	0	0	3	2

Preamble: The purpose of this lab is to provide practical experience in the operation and testing of synchronous and induction machines.

Prerequisite : Fundamentals of Electrical Engineering

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Analyse the performance of single phase and three phase induction motors by conducting suitable tests.
CO 2	Analyse the performance of three phase synchronous machine from V and inverted V curves.
CO 3	Analyse the performance of a three phase alternator by conducting suitable tests.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	2	-	-	-	-	3	2	-	3
CO 2	3	3	2	2	-	-	-	-	3	2	-	3
CO 3	3	3	2	2	-	-	-	-	3	2	-	3

Assessment Pattern

Marks distribution

Total Marks	CIE	ESE	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation Pattern:

Attendance:	15 marks
Continuous Assessment:	30 marks
Internal Test (Immediately before the second series test) :	30 marks

End Semester Examination Pattern: The following guidelines should be followed regarding award of marks

(a) Preliminary work	15 Marks
(b) Implementing the work/Conducting the experiment	10 Marks
(c) Performance, result and inference (usage of equipment and trouble-shooting)	25 Marks
(d) Viva voce	20 marks
(e) Record	5 Marks

General instructions: Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified Laboratory Record. The external examiner shall endorse the record.

LIST OF EXPERIMENTS

(A minimum of **TWELVE** experiments are mandatory out of the fifteen listed.)

1. Load test on a three phase Slip Ring Induction Motor

Objectives:

a) Start the motor using auto transformer or rotor resistance starter
b) Plot the performance characteristics

2. No load and block rotor tests on a three phase Squirrel Cage Induction Motor

Objectives:

a) Predetermination of performance parameters from circle diagram
b) Determination of equivalent circuit

3. Starting of a three phase Squirrel Cage Induction Motor using Y-Δ Starter

Objectives:

a) Start the motor using Y-Δ Starter and perform load test
b) Plot the performance characteristics

4. Performance characteristics of a Pole Changing Induction Motor

Objectives:

a) Run the motor in two different pole configurations (example 4 pole and 8 pole)
b) Analyse the performance in the two cases by constructing circle diagrams and compare the results

5. No Load and Blocked Rotor Tests on a single phaseInduction Motor

Objectives:

a) Conduct no load and blocked rotor tests on the motor
b) Predetermine the equivalent circuit

6. Load Test on a single phaseInduction Motor

Objectives:

a) Perform load test on the motor

b) Plot the performance characteristics of the motor

7. Variation of starting torque with rotor resistance in Slip-Ring Induction Motors

Objectives:

a) Plot the variation of starting torque against rotor resistance in a three phase slip ring induction motor
b) Find the external rotor resistance for which maximum starting torque is obtained.

8. V and inverted V curves of a Synchronous Motor

Objectives:

Plot the V and inverted V curves of the Synchronous Motor at no load and full load.

9. Regulation of a three phase Alternator by direct loading

Objectives:

a) Determine the regulation of three phase alternator
b) Plot the regulation versus load curve

10. Regulation of a three phase Alternator by emf and mmf methods

Objectives:

Predetermine the regulation of alternator by emf and mmf methods at 0.8pf lag, upf and 0.8pf lead.

11. Regulation of a three phase alternator by Potier method

Objectives:

a) Synchronize the alternator by dark lamp method
b) Plot ZPF characteristics and determine armature reactance mmf and potier reactance
c) Predetermine the regulation by ZPF method

12. Reactive power control in grid connected Alternators

Objectives:

a) Synchronize the alternator by bright lamp method
b) Control the reactive power and plot the V and inverted V curves for generator operation

13. Slip Test on a three phase Salient Pole Alternator

Objectives:

a) Determine the direct and quadrature axis synchronous reactances
b) Predetermine the regulation at 0.8 lagging power factor

14. V/f control of three phase Squirrel Cage Induction Motor

Objectives:

Perform speed control of the given three phase induction motor by V/f control

15. Performance characteristics of a three phase Induction Generator

Objectives:

Plot the performance characteristics of the generator.

Reference Books

1) Bimbra P S, *Electric Machines*, Khanna Publishers, 2nd edition, 2017.

2). KothariD. P., NagrathI. J., *Electric Machines*, Tata McGraw Hill, 5th edition, 2017.

3) Say M.G, *The Performance and Design of AC Machines*, CBS Publishers, New Delhi, 3rd edition, 2002.

4) Alexander SLangsdorf, "Theory of Alternating Current Machinery", Tata McGraw Hill, 2nd revised edition, 2001.

HUT 300	Industrial Economics & Foreign Trade	Category	L	T	P	CREDIT
		HSMC	3	0	0	3

Preamble: To equip the students to take industrial decisions and to create awareness of economic environment.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: **Understand**)
CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: **Apply**)
CO3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: **Analyse**)
CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: **Analyse**)
CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: **Analyse**)

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2										3	
CO2	2	2			2	2	3				3	
CO3	2	2	1								3	
CO4	2	2	1			1					3	
CO5	2	2	1								3	

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination Marks**
	Test 1 (Marks)	**Test 2 (Marks)**	
Remember	**15**	**15**	**30**
Understand	**20**	**20**	**40**
Apply	**15**	**15**	**30**

Mark Distribution

Total Marks	**CIE Marks**	**ESE Marks**	**ESE Duration**
150	**50**	**100**	**3 hours**

Continuous Internal Evaluation Pattern:

Attendance	: 10 marks
Continuous Assessment - Test (2 numbers)	: 25 marks
Continuous Assessment - Assignment	: 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B.

Part A	: 30 marks
Part B	: 70 marks

Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 3 sub-divisions and carries 14 marks.

SYLLABUS

HUT 300 Industrial Economics & Foreign Trade

Module 1 (Basic Concepts and Demand and Supply Analysis)

Scarcity and choice - Basic economic problems- PPC – Firms and its objectives – types of firms – Utility – Law of diminishing marginal utility – Demand and its determinants – law of demand – elasticity of demand – measurement of elasticity and its applications – Supply, law of supply and determinants of supply – Equilibrium – Changes in demand and supply and its effects – Consumer surplus and producer surplus (Concepts) – Taxation and deadweight loss.

Module 2 (Production and cost)

Production function – law of variable proportion – economies of scale – internal and external economies – Isoquants, isocost line and producer's equilibrium – Expansion path – Technical progress and its implications – Cobb-Douglas production function - Cost concepts – Social cost: private cost and external cost – Explicit and implicit cost – sunk cost - Short run cost curves - long run cost curves – Revenue (concepts) – Shutdown point – Break-even point.

Module 3 (Market Structure)

Perfect and imperfect competition – monopoly, regulation of monopoly, monopolistic completion (features and equilibrium of a firm) – oligopoly – Kinked demand curve – Collusive oligopoly (meaning) – Non-price competition – Product pricing – Cost plus pricing – Target return pricing – Penetration pricing – Predatory pricing – Going rate pricing – Price skimming.

Module 4 (Macroeconomic concepts)

Circular flow of economic activities – Stock and flow – Final goods and intermediate goods - Gross Domestic Product - National Income – Three sectors of an economy- Methods of measuring national income – Inflation- causes and effects – Measures to control inflation- Monetary and fiscal policies – Business financing- Bonds and shares -Money market and Capital market – Stock market – Demat account and Trading account - SENSEX and NIFTY.

Module 5 (International Trade)

Advantages and disadvantages of international trade - Absolute and Comparative advantage theory - Heckscher - Ohlin theory - Balance of payments – Components – Balance of Payments

deficit and devaluation – Trade policy – Free trade versus protection – Tariff and non-tariff barriers.

Reference Materials

1. Gregory N Mankiw, 'Principles of Micro Economics', Cengage Publications
2. Gregory N Mankiw, 'Principles of Macro Economics', Cengage Publications
3. Dwivedi D N, 'Macro Economics', Tata McGraw Hill, New Delhi.
4. Mithani D M, 'Managerial Economics', Himalaya Publishing House, Mumbai.
5. Francis Cherunilam, 'International Economics', McGraw Hill, New Delhi.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Why does the problem of choice arise?
2. What are the central problems?
3. How do we solve the basic economic problems?
4. What is the relation between price and demand?
5. Explain deadweight loss due to the imposition of a tax.

Course Outcome 2 (CO2):

1. What is shutdown point?
2. What do you mean by producer equilibrium?
3. Explain break-even point;
4. Suppose a chemical factory is functioning in a residential area. What are the external costs?

Course Outcome 3 (CO3):

1. Explain the equilibrium of a firm under monopolistic competition.
2. Why is a monopolist called price maker?
3. What are the methods of non-price competition under oligopoly?

4. What is collusive oligopoly?

Course Outcome 4 (CO4):

1. What is the significance of national income estimation?
2. How is GDP estimated?
3. What are the measures to control inflation?
4. How does inflation affect fixed income group and wage earners?

Course Outcome 5 (CO5):

1. What is devaluation?
2. Suppose a foreign country imposes a tariff on Indian goods. How does it affect India's exports?
3. What is free trade?
4. What are the arguments in favour of protection?

Model Question paper

QP CODE: **PAGES:3**

Reg No:_____ **Name :_____**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY FIFTH /SIXTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: HUT 300

Course Name: Industrial Economics & Foreign Trade

Max.Marks:100 **Duration: 3 Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. Why does an economic problem arise?

2. What should be the percentage change in price of a product if the sale is to be increased by 50 percent and its price elasticity of demand is 2?

3. In the production function Q= $2L^{1/2}K^{1/2}$ if L=36 how many units of capital are needed to produce 60 units of output?

4. Suppose in the short run AVC 4. Suppose in the short run AVC<P<AC. Will this firm produce or shut down? Give reason.

5. What is predatory pricing?

6. What do you mean by non- price competition under oligopoly?

7. What are the important economic activities under primary sector?

8. Distinguish between a bond and share?

9. What are the major components of balance of payments?

10. What is devaluation? **(10 x 3 = 30 marks)**

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Prepare a utility schedule showing units of consumption, total utility and marginal utility, and explain the law of diminishing marginal utility. Point out any three limitations of the law.

    b) How is elasticity of demand measured according to the percentage method? How is the measurement of elasticity of demand useful for the government?

Or

12. a) Explain the concepts consumer surplus and producer surplus.

    b) Suppose the government imposes a tax on a commodity where the tax burden met by the consumers. Draw a diagram and explain dead weight loss. Mark consumer surplus, producer surplus, tax revenue and dead weight loss in the diagram.

MODULE II

13. a) What are the advantages of large-scale production?

    b) Explain Producer equilibrium with the help of isoquants and isocost line. What is expansion path?

Or

14. a) Explain break-even analysis with the help of a diagram.

    b) Suppose the monthly fixed cost of a firm is Rs. 40000 and its monthly total variable cost is Rs. 60000.

    i. If the monthly sales is Rs. 120000 estimate contribution and break-even sales.
    ii. If the firm wants to get a monthly profit of Rs.40000, what should be the sales?

    c) The total cost function of a firm is given as $TC=100+50Q - 11Q^2+Q^3$. Find marginal cost when output equals 5 units.

MODULE III

15. a) What are the features of monopolistic competition?

b) Explain the equilibrium of a firm earning supernormal profit under monopolistic competition.

Or

16. a) Make comparison between perfect competition and monopoly.

b) Explain price rigidity under oligopoly with the help of a kinked demand curve.

MODULE IV

17. a) How is national income estimated under product method and expenditure method?

b) Estimate GDPmp, GNPmp and National income

Private consumption expenditure	= 2000 (in 000 cores)
Government Consumption	= 500
NFIA	= -(300)
Investment	= 800
Net=exports	=700
Depreciation	= 400
Net-indirect tax	= 300

Or

18. a) What are the monetary and fiscal policy measures to control inflation?

b) What is SENSEX?

MODULE V

19. a) What are the advantages of disadvantages of foreign trade?

b) Explain the comparative cost advantage.

Or

20. a) What are the arguments in favour protection?

b) Examine the tariff and non-tariff barriers to international trade.

(5 × 14 = 70 marks)

Teaching Plan

Module 1 (Basic concepts and Demand and Supply Analysis)		**7 Hours**
1.1	Scarcity and choice – Basic economic problems - PPC	1 Hour
1.2	Firms and its objectives – types of firms	1 Hour
1.3	Utility – Law of diminishing marginal utility – Demand – law of demand	1 Hour
1.4	Measurement of elasticity and its applications	1 Hour
1.5	Supply, law of supply and determinants of supply	1 Hour
1.6	Equilibrium – changes in demand and supply and its effects	1 Hour
1.7	Consumer surplus and producer surplus (Concepts) – Taxation and deadweight loss.	1 Hour
Module 2 (Production and cost)		**7 Hours**
2.1	Productions function – law of variable proportion	1 Hour
2.2	Economies of scale – internal and external economies	1 Hour
2.3	producers equilibrium – Expansion path	1 Hour
2.4	Technical progress and its implications – cob Douglas Production function	1 Hour
2.5	Cost concepts – social cost: private cost and external cost – Explicit and implicit cost – sunk cost	1 Hour
2.6	Short run cost curves & Long run cost curves	1 Hour
2.7	Revenue (concepts) – shutdown point – Break-even point.	1 Hour
Module 3 (Market Structure)		**6 hours**
3.1	Equilibrium of a firm, MC – MR approach and TC – TR approach	1 Hour
3.2	Perfect competition & Imperfect competition	1 Hour
3.3	Monopoly – Regulation of monopoly – Monopolistic competition	1 Hour
3.4	Oligopoly – kinked demand curve	1 Hour
3.5	Collusive oligopoly (meaning) – Non price competition	1 Hour
3.6	Cost plus pricing – Target return pricing – Penetration, Predatory pricing – Going rate pricing – price skimming	1 Hour

Module 4 (Macroeconomic concepts)		7 Hours
4.1	Circular flow of economic activities	1 Hour
4.2	Stock and flow – Final goods and intermediate goods – Gross Domestic Product - National income – Three sectors of an economy	1 Hour
4.3	Methods of measuring national income	1 Hour
4.4	Inflation – Demand pull and cost push – Causes and effects	1 Hour
4.5	Measures to control inflation – Monetary and fiscal policies	1 Hour
4.6	Business financing – Bonds and shares – Money market and capital market	1 Hour
4.7	Stock market – Demat account and Trading account – SENSEX and NIFTY	1 Hour
Module 5 (International Trade)		**8 Hours**
5.1	Advantages and disadvantages of international trade	1 Hour
5.2	Absolute and comparative advantage theory	2 Hour
5.3	Heckscher – Ohlin theory	1 Hour
5.4	Balance of payments - components	1 Hour
5.5	Balance of payments deficit and devaluation	1 Hour
5.6	Trade policy – Free trade versus protection	1 Hour
5.7	Tariff and non tariff barriers.	1 Hour

MCN 301	DISASTER MANAGEMENT	Category	L	T	P	CREDIT	YEAR OF INTRODUCTION
		Non - Credit	2	0	0	Nil	2019

Preamble: The objective of this course is to introduce the fundamental concepts of hazards and disaster management.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: **Understand**).
CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: **Understand**).
CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: **Understand**).
CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: **Apply**)
CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: **Understand**).
CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: **Understand**).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2
CO1		2				2				2		2
CO2	2	3	2		2	2	3			3		2
CO3	2	3	2	2	2	2	3			3		2
CO4	3	3	3		2	2	3					2
CO5	3	3			2	2	3					2
CO6	3					2	3	3				2

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Life long learning

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination Marks
	Test 1 (Marks)	Test 2 (Marks)	
Remember	**10**	**10**	**20**
Understand	**25**	**25**	**50**
Apply	**15**	**15**	**30**
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	**50**	**100**	**3 hours**

Continuous Internal Evaluation Pattern:

Attendance : 10 marks

Continuous Assessment - Test : 25 marks

Continuous Assessment - Assignment : 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A.

Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

SYLLABUS

MCN 301 Disaster Management

Module 1

Systems of earth

Lithosphere- composition, rocks, soils; Atmosphere-layers, ozone layer, greenhouse effect, weather, cyclones, atmospheric circulations, Indian Monsoon; hydrosphere- Oceans, inland water bodies; biosphere

Definition and meaning of key terms in Disaster Risk Reduction and Management- disaster, hazard, exposure, vulnerability, risk, risk assessment, risk mapping, capacity, resilience, disaster risk reduction, disaster risk management, early warning systems, disaster preparedness, disaster prevention, disaster mitigation, disaster response, damage assessment, crisis counselling, needs assessment.

Module 2

Hazard types and hazard mapping; Vulnerability types and their assessment- physical, social, economic and environmental vulnerability.

Disaster risk assessment –approaches, procedures

Module 3

Disaster risk management -Core elements and phases of Disaster Risk Management

Measures for Disaster Risk Reduction – prevention, mitigation, and preparedness.

Disaster response- objectives, requirements; response planning; types of responses.

Relief; international relief organizations.

Module 4

Participatory stakeholder engagement; Disaster communication- importance, methods, barriers; Crisis counselling

Capacity Building: Concept – Structural and Non-structural Measures, Capacity Assessment; Strengthening Capacity for Reducing Risk

Module 5

Common disaster types in India; Legislations in India on disaster management; National disaster management policy; Institutional arrangements for disaster management in India.

The Sendai Framework for Disaster Risk Reduction- targets, priorities for action, guiding principles

Reference Text Book

1. R. Subramanian, Disaster Management, Vikas Publishing House, 2018
2. M. M. Sulphey, Disaster Management, PHI Learning, 2016
3. UNDP, Disaster Risk Management Training Manual, 2016
4. United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015-2030, 2015

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is the mechanism by which stratospheric ozone protects earth from harmful UV rays?
2. What are disasters? What are their causes?
3. Explain the different types of cyclones and the mechanism of their formation
4. Explain with examples, the difference between hazard and risk in the context of disaster management
5. Explain the following terms in the context of disaster management (a) exposure (b) resilience (c) disaster risk management (d) early warning systems, (e) damage assessment (f) crisis counselling (g) needs assessment

Course Outcome 2 (CO2):

1. What is hazard mapping? What are its objectives?
2. What is participatory hazard mapping? How is it conducted? What are its advantages?
3. Explain the applications of hazard maps
4. Explain the types of vulnerabilities and the approaches to assess them

Course Outcome 3 (CO3):

1. Explain briefly the concept of ‘disaster risk’

2. List the strategies for disaster risk management ‘before’, ‘during’ and ‘after’ a disaster
3. What is disaster preparedness? Explain the components of a comprehensive disaster preparedness strategy

Course Outcome 4 (CO4):

1. What is disaster prevention? Distinguish it from disaster mitigation giving examples
2. What are the steps to effective disaster communication? What are the barriers to communication?
3. Explain capacity building in the context of disaster management

Course Outcome 5 (CO5):

1. Briefly explain the levels of stakeholder participation in the context of disaster risk reduction
2. Explain the importance of communication in disaster management
3. Explain the benefits and costs of stakeholder participation in disaster management
4. How are stakeholders in disaster management identified?

Course Outcome 6 (CO6):

1. Explain the salient features of the National Policy on Disaster Management in India
2. Explain the guiding principles and priorities of action according to the Sendai Framework for Disaster Risk Reduction
3. What are Tsunamis? How are they caused?
4. Explain the earthquake zonation of India

Model Question paper

QP CODE: **PAGES:3**

Reg No:_____ **Name :_____**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: MCN 301

Course Name: Disaster Management

Max.Marks:100 **Duration: 3 Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. What is the mechanism by which stratospheric ozone protects earth from harmful UV rays?
2. What are disasters? What are their causes?
3. What is hazard mapping? What are its objectives?
4. Explain briefly the concept of ‘disaster risk’
5. List the strategies for disaster risk management ‘before’, ‘during’ and ‘after’ a disaster
6. What is disaster prevention? Distinguish it from disaster mitigation giving examples
7. Briefly explain the levels of stakeholder participation in the context of disaster risk reduction
8. Explain the importance of communication in disaster management
9. What are Tsunamis? How are they caused?
10. Explain the earthquake zonation of India

Part B

Answer any one Question from each module. Each question carries 14 Marks

11. a. Explain the different types of cyclones and the mechanism of their formation [10]

b. Explain with examples, the difference between hazard and risk in the context of disaster management
[4]

OR

12. Explain the following terms in the context of disaster management [14]

(a) exposure (b) resilience (c) disaster risk management (d) early warning systems, (e) damage assessment (f) crisis counselling (g) needs assessment

13. a. What is participatory hazard mapping? How is it conducted? What are its advantages?

[8]

b. Explain the applications of hazard maps [6]

OR

14. Explain the types of vulnerabilities and the approaches to assess them [14]

15. a. Explain the core elements of disaster risk management [8]

b. Explain the factors that decide the nature of disaster response [6]

OR

16. a. What is disaster preparedness? Explain the components of a comprehensive disaster preparedness strategy [6]

b. Explain the different disaster response actions [8]

17. a. Explain the benefits and costs of stakeholder participation in disaster management [10]

b. How are stakeholders in disaster management identified? [4]

OR

18. a. What are the steps to effective disaster communication? What are the barriers to communication? [7]

b. Explain capacity building in the context of disaster management [7]

19. Explain the salient features of the National Policy on Disaster Management in India

[14]

OR

20. Explain the guiding principles and priorities of action according to the Sendai Framework for Disaster Risk Reduction [14]

Teaching Plan

	Module 1	**5 Hours**
1.1	Introduction about various Systems of earth, Lithosphere-composition, rocks, Soils; Atmosphere-layers, ozone layer, greenhouse effect, weather	1 Hour
1.2	Cyclones, atmospheric circulations, Indian Monsoon; hydrosphere-Oceans, inland water bodies; biosphere	1 Hour
1.3	Definition and meaning of key terms in Disaster Risk Reduction and Management- disaster, hazard,	1 Hour
1.4	Exposure, vulnerability, risk, risk assessment, risk mapping, capacity, resilience, disaster risk reduction, Disaster risk management, early warning systems	1 Hour
1.5	Disaster preparedness, disaster prevention, disaster, Mitigation, disaster response, damage assessment, crisis counselling, needs assessment.	1 Hour
	Module 2	**5 Hours**
2.1	Various Hazard types, Hazard mapping; Different types of Vulnerability types and their assessment	1 Hour
2.2	Vulnerability assessment and types, Physical and social vulnerability	1 Hour
2.3	Economic and environmental vulnerability, Core elements of disaster risk assessment	1 Hour
2.4	Components of a comprehensive disaster preparedness strategy approaches, procedures	1 Hour
2.5	Different disaster response actions	1 Hour
	Module 3	**5 Hours**
3.1	Introduction to Disaster risk management, Core elements of Disaster Risk Management	1 Hour
3.2	Phases of Disaster Risk Management, Measures for Disaster Risk Reduction	1 Hour
3.3	Measures for Disaster prevention, mitigation, and preparedness.	1 Hour

3.4	Disaster response- objectives, requirements. Disaster response planning; types of responses.	1 Hour
3.5	Introduction- Disaster Relief, Relief; international relief organizations.	1 Hour
	Module 4	**5 Hours**
4.1	Participatory stakeholder engagement	1 Hour
4.2	Importance of disaster communication.	1 Hour
4.3	Disaster communication- methods, barriers. Crisis counselling	1 Hour
4.4	Introduction to Capacity Building. Concept – Structural Measures, Non-structural Measures.	1 Hour
4.5	Introduction to Capacity Assessment, Capacity Assessment; Strengthening, Capacity for Reducing Risk	1 Hour
	Module 5	**5 Hours**
5.1	Introduction-Common disaster types in India.	1 Hour
5.2	Common disaster legislations in India on disaster management	1 Hour
5.3	National disaster management policy, Institutional arrangements for disaster management in India.	1 Hour
5.4	The Sendai Framework for Disaster Risk Reduction and targets	1 Hour
5.5	The Sendai Framework for Disaster Risk Reduction-priorities for action, guiding principles	1 Hour