U23

Matrusri Engineering College

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(Approved by AICTE & Affiliated to Osmania University)

B.E. IV Semester (Main) (Branch: IT,CME) Examination, July 2025

Subject: Probability & Statistics

Time : 3 hours Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

Q.No.			Marks	CO,BTS
1.	a)	Given P(A) = $\frac{1}{4}$, P(B) = $\frac{1}{3}$ and P (A∪ B) = $\frac{1}{2}$, evaluate i) $P(A/B)$ ii) $P(B/A)$ iii) $P\ (A \cap B^c)$	(2)	CO1,L2
	b)	A Poisson variate satisfies $P(X = 1) = 0.5\,P(X = 2)$ then find $P(X = 4)$.	(2)	CO2,L3
	c)	Define Exponential distribution.	(2)	CO3,L2
	d)	Find the correlation coefficient for the following data	(2)	CO4,L2
	e)	Define Type I and Type II Errors.	(2)	CO5,L2
	f)	State Baye's theorem.	(2)	CO1,L1
	g)	Write the properties of the Normal distribution.	(2)	CO3,L1

x	1	2	3	4	5
y	2	5	3	8	7

2	(a)	Three machines M_1, M_2 and M_3 produce identical items. Of their respective output 5%, 4% and 3% of items are faulty. On a certain day, M_1 has produced 25% of the total output, M_2 has produced 30% and M_3 the remainder 45%. An item is selected at random is found to be faulty. What are the chances that it was produced by the machine M_3 ?	(7)	CO1,L2
	(b)	X is a continuous random variable with probability density function given by $$f(x) = \begin{cases} kx & 0 \le x < 2 \\ 2k & 2 \le x < 4 \\ -kx + 6k & 4 \le x < 6 \end{cases}$$ Find k and mean value of X.	(7)	CO1,L2
3	(a)	Fit a Binomial distribution to the following data	(7)	CO2,L3
	(b)	Derive mean of Poisson distribution.	(7)	CO2,L2

x	0	1	2	3	4	5
y	2	14	20	34	22	8

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4 (a) If X is uniformly distributed with mean 1 and variance 4/3. Find $p(X < 0)$. (7) CO3,L2

(b) If X is a normal variate with mean 30 and S.D. 5, find the probabilities that (7) CO3,L3

(i) $26 \leq X \leq 40$ (ii) $X \geq 45$ (iii) $|X - 30| > 5$.

Given that $P(0 \leq Z \leq 0.8) = 0.2881, P(0 \leq Z \leq 2) = 0.4772, P(0 \leq Z \leq 3) = 0.4986, P(0 \leq Z \leq 1) = 0.3413$.

5 (a) Fit a second degree parabola to the following data: (7) CO4,L3

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(b) The ranks of ten participants in a contest by two judges as follows. (7) CO4,L2

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient ρ.

6 (a) The means of two single large samples of 1,000 and 2,000 members are 67.5 inches and 68 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance) ($Z_{\alpha/2} = 1.96$). (7) CO5,L3

(b) The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% level of significance assuming that for 9 degrees of freedom ($t_{0.05} = 1.83$) (7) CO5,L3

7 (a) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens manufactured, find the probability that (5) CO2,L3

(a) Exactly two will be defective

(b) At least two will be defective

(c) None will be defective

(b) The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ amd $y = 11.64 - 0.50x$. Find (i) mean of x's, (ii) mean of y's and (iii) the correlation coefficient between x and y. (5) CO4,L2

(c) A random sample of 1,000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat eaters are equally popular in this state at 1% level of significance? ($Z_{\alpha/2} = 2.58$) (4) CO5,L3

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B.E. IV Semester (Main) (Branch: CIVIL)Examination, July 2025

Subject: Partial Differential Equations, P&S

Time : 3 hours | Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

Q.No.			Marks	CO,BTS
1.	a)	Find the general solution of p+q = 1	(2)	CO1,L2
	b)	Write about one dimensional wave equation	(2)	CO2,L1
	c)	Define conditional probability.	(2)	CO3,L1
	d)	Determine the Binomial Distribution for which mean is 4 and variance is 3.	(2)	CO4,L2
	e)	Write the normal equations to fit a straight line.	(2)	CO5,L1
	f)	State and Prove Addition theorem on probability?	(2)	CO3,L1
	g)	Find mean of the Poisson distribution?	(2)	CO4,L2
2	(a)	Solve the partial differential equation $(y+z)p+(z+x)q = x+y$	(7)	CO1,L2
	(b)	Solve px+qy = pq by Charpit s method	(7)	CO1,L3
3	(a)	Solve $y^3\frac{\partial z}{\partial x} + x^2\frac{\partial z}{\partial y} = 0$	(6)	CO1,L2
	(b)	Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$,where $u(x,0) = 6e^{-3x}$ by method of separation of variables.	(8)	CO2,L2
4	(a)	State and prove Baye's theorem	(7)	CO3,L2
	(b)	For the discrete probability distribution	(7)	CO3,L2

x	0	1	2	3	4	5	6
y	0	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find k and evaluate p(x<6)as well as p(x>6)

5	(a)	In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution $P(0 < Z \leq 0.5) = 0.19, P(0 < Z \leq 1.4) = 0.42$	(7)	CO4,L2
	(b)	Find the regression line of y on x when	(7)	CO4,L3

x	10	12	13	12	16	15
y	40	38	43	45	37	43

6	(a)	Using the method of least squares, fit a parabola $y=a+bx+cx^2$ to the data	(7)	CO5,L3

x	0	1	2	3	4
y	1	0	3	10	21

	(b)	In a sample of 1000 people in Kerala 540 are rice eaters and rest are wheat eaters Can we assume that both rice and wheat eaters are equally popular in this state at 5% level of significance ($Z_{\alpha/2} = 1.96$)	(7)	CO5,L2

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7 (a) Find the rank coefficient for the following data (7) CO4,L3

x	5	7	3	4
y	45	35	29	29

(b) Find General Solution of one dimensional wave equation. (7) CO2,L2

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B.E. IV Semester (Main) (Branch: CSE,CSE-DS) Examination, July 2025

Subject: SOFTWARE ENGINEERING

Time : 3 hours | Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

Q.No.			Marks	CO,BTS
1.	a)	What is meant by the "changing nature of software"?	(2)	CO1,L1
	b)	What are the key tasks of requirements engineering?	(2)	CO2,L1
	c)	What is object-oriented analysis?	(2)	CO3,L1
	d)	What is software architecture?	(2)	CO4,L1
	e)	List any two debugging techniques.	(2)	CO5,L1
	f)	Mention any two characteristics of software.	(2)	CO1,L1
	g)	What are class-based components?	(2)	CO4,L1
2	(a)	Explain the software process framework and how it helps in process standardization.	(7)	CO1,L2
	(b)	Explain CMMI levels and their importance in improving software processes.	(7)	CO1,L2
3	(a)	Explain in detail the agile process models and their role in modern software development.	(7)	CO2,L2
	(b)	Explain the need, structure, and value of a good Software Requirements Analysis and Specification (SRS) with real-world relevance.	(7)	CO2,L3
4	(a)	Explain flow-oriented, scenario-based, and class-based modeling in detail with examples.	(7)	CO3,L2
	(b)	Discuss how behavioral models are created and used in software analysis with an example.	(7)	CO3,L3
5	(a)	Describe in detail the steps of user interface design and how it improves user experience with an example.	(7)	CO4,L2
	(b)	Explain the process of conducting component-level design with class-based and conventional components.	(7)	CO4,L1
6	(a)	Describe black-box and white-box testing techniques with advantages and examples.	(7)	CO5,L2
	(b)	Explain the DevOps lifecycle and how it enables business agility and continuous testing.	(7)	CO5,L2
7	(a)	Compare evolutionary and incremental models with suitable examples.	(5)	CO1,L2
	(b)	Explain the terms cohesion and coupling with suitable examples.	(5)	CO3,L2
	(c)	Describe the ISO 9000 quality standards in the context of software development.	(4)	CO5,L3

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B.E. IV Semester (Main) (Branch: ECE) Examination, July 2025

Subject: Digital System Design - 2

Time : 3 hours Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

Q. No.			Marks	CO,BTS
1.	a)	Define "module" in Verilog HDL.	(2)	CO1,L1
	b)	List two types of procedural timing controls.	(2)	CO1,L1
	c)	What is partition method in state minimization?	(2)	CO3,L2
	d)	Why are timing considerations important in ASM-based design?	(2)	CO4,L2
	e)	What is the major difference between a PAL and a PLA in terms of programmability?	(2)	CO5,L2
	f)	Write a Verilog dataflow model for a 4-to-1 multiplexer using the conditional (? :) operator.	(2)	CO1,L3
	g)	What is a primitive flow table, and how is it used in asynchronous design?	(2)	CO3,L2
2	(a)	Explain hierarchical modeling in Verilog. Discuss modules, ports, and module instantiation with an example of a 2-bit adder built from two 1-bit full adders.	(10)	CO1,L2
	(b)	Write a test bench for an 8-bit comparator. Verify A=B, A>B, and A<B scenarios with corner cases.	(4)	CO1,L3
3	(a)	Design a CMOS NAND gate using switch-level modeling. Derive truth table and write Verilog code.	(8)	CO2,L3
	(b)	Write a test bench for a 4-bit comparator using 'fork-join' for parallel stimulus.	(6)	CO2,L3
4	(a)	What is the purpose of a counter? Design a Modulo-10 (Decade) Counter with Enable.	(8)	CO3,L3
	(b)	Write a Verilog code in behavioral modeling for 3 to 8 decoder with neat block diagram and truth table.	(6)	CO2,L3
5	(a)	What is an ASMD chart? Design an ASMD chart for a 2-bit binary multiplier using a shift-and-add approach.	(7)	CO4,L3
	(b)	What are race conditions in asynchronous circuits? Write the differences between critical and non-critical races with examples.	(7)	CO4,L2

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6	(a)	Describe the architecture of an FPGA. Illustrate its basic building blocks and explain how it differs from a CPLD.	(7)	CO5,L2
	(b)	Differentiate between full-custom, standard-cell, and gate array-based ASIC designs.	(7)	CO5,L2
7	(a)	List and explain the different data types used in Verilog HDL.	(5)	CO1,L2
	(b)	Write Verilog behavioral code for a positive-edge triggered D flip-flop with asynchronous reset. Explain its working with the help of a timing diagram.	(5)	CO3,L3
	(c)	Explain one-hot state encoding with a simple example.	(4)	CO3,L2

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B.E. IV Semester (Main) (Branch: **MECH)** Examination, July 2025

Subject:Fluid Mechanics & Hydraulic Machines

Time : 3 hours Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
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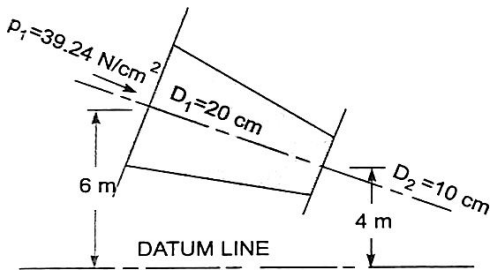
Q.No.			Marks	CO, BTS
1.	a)	Define mass density and specific Gravity?	(2)	CO1,L1
	b)	Differentiate between Laminar and Turbulent flow.	(2)	CO2,L2
	c)	List out the head losses in pipes?	(2)	CO3,L1
	d)	Define Cavitation?	(2)	CO4,L1
	e)	What is mean by specific speed in hydraulic pumps?	(2)	CO5,L1
	f)	Define Discharge? Mention units of Discharge.	(2)	CO2,L1
	g)	Differentiate between Turbine and Pump.	(2)	CO4,L2
2	(a)	Calculate the capillary rise in a glass tube 2.5 mm diameter when immersed vertically in: i) water ii) mercury. Take surface tension = 0.00725 N/m for water surface tension = 0.52 N/m for mercury in contact with air. The specific gravity of mercury is given as 13.6 and angle of contact=130^0	(7)	CO1,L3
	(b)	What is differential manometer? Explain how it works?	(7)	CO1,L1
3	(a)	Define and distinguish between: i) Steady flow and Unsteady flow (ii) Uniform and Non uniform flow	(4)	CO2,L1
	(b)	The water is flowing through a pipe having diameter of 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.	(10)	CO2,L3



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4	(a)	Explain what you understand by Hydraulic Grade Line and Total Energy Line. Discuss its practical significance in analysis of fluid flow problems	(7)	CO3,L2
	(b)	Derive Darcy- Weisbach's equation.	(7)	CO3,L2
5	(a)	Describe the working of a Pelton wheel turbine.	(7)	CO4,L2
	(b)	Draw main characteristic curves of hydraulic turbine.	(7)	CO4,L2
6	(a)	What are the basic components of Hydraulic circuit? Explain about major components.	(7)	CO5,L2
	(b)	What is a reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch.	(7)	CO5,L1
7	(a)	Define the terms gauge pressure, vacuum pressure and absolute pressure? Indicate their relative positions on a chart	(5)	CO1,L1
	(b)	Define unit speed, unit power and specific speed as used in connection with the operation of a hydraulic machine.	(5)	CO4,L1
	(c)	Define Pump and Classify the Hydraulic Pumps	(4)	CO5,L1

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B.E. IV Semester (Main) (Branch: EEE) Examination, July 2025

Subject: Digital Electronics and Logic Design

Time : 3 hours Max. Marks : 70

Note : i) **FIRST** Question is compulsory and answer any **FOUR** questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

Q.No.			Marks	CO,BTL
1.	a)	State De Morgan's Laws.	(2)	CO1,L2
	b)	Draw the block diagram of a multiplexer.	(2)	CO2,L1
	c)	Draw the general circuit of T flip-flop.	(2)	CO3,L2
	d)	List A/D converter IC.	(2)	CO4,L1
	e)	Write short notes on ROM and RAM.	(2)	CO5,L1
	f)	Find the minimal expression for the function using K-map. $F(A,B,C,D)=\sum(0,1,2,3,4,6,7,8,9,11,15)$	(2)	CO2,L3
	g)	Write short notes on Field Programmable Gate Array.	(2)	CO5,L2
2	(a)	Add 25+(-40) using 2's complement arithmetic.	(4)	CO1,L3
	(b)	Minimize the four-variable logic function using K-map. $f(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$	(10)	CO2,L3
3	(a)	What is Full-adder? Deduce the full adder circuit by using 2 half adders.	(7)	CO2,L2
	(b)	Implement following function using 8x1 MUX with X,Y and Z as select lines. $f(W,X,Y,Z) = \sum m(0, 1, 2, 7, 8, 9,10, 11, 12)$	(7)	CO1,L2
4	(a)	Write the truth table and excitation table of J-K flip-flop.	(7)	CO3,L2
	(b)	Convert S-R flip-flop to D flip-flop. Give its necessary truth tables and mapping structure.	(7)	CO3,L3
5	(a)	Explain in detail R-2R D/A Converter and Successive approximation A/D Converter.	(10)	CO4,L2
	(b)	Draw the circuit diagram of Dual Slope A/D converter.	(4)	CO4,L2
6	(a)	Write short notes on Field Programmable Gate Array and Content Addressable Memory.	(7)	CO5,L2
	(b)	Explain in detail about Complex Programmable Logic Devices.	(7)	CO5,L2
7	(a)	Realize the basic gates with only NAND gates.	(5)	CO1,L2
	(b)	Convert S-R to J-K flip flop.	(5)	CO3,L3
	(c)	Compare Combinational and Sequential circuits.	(4)	CO2,L2

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