

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL
 Register No. 14EE205

VI SEMESTER B.Tech. (E & E) END SEM EXAM, APR 2017
 EE311: DIGITAL SYSTEM DESIGN, (Credit Scheme), PSE

Duration: 3 Hours

Weightage: 50%

Maximum Marks: 50

1. Analyze the sequential circuit shown in Fig.1 below:

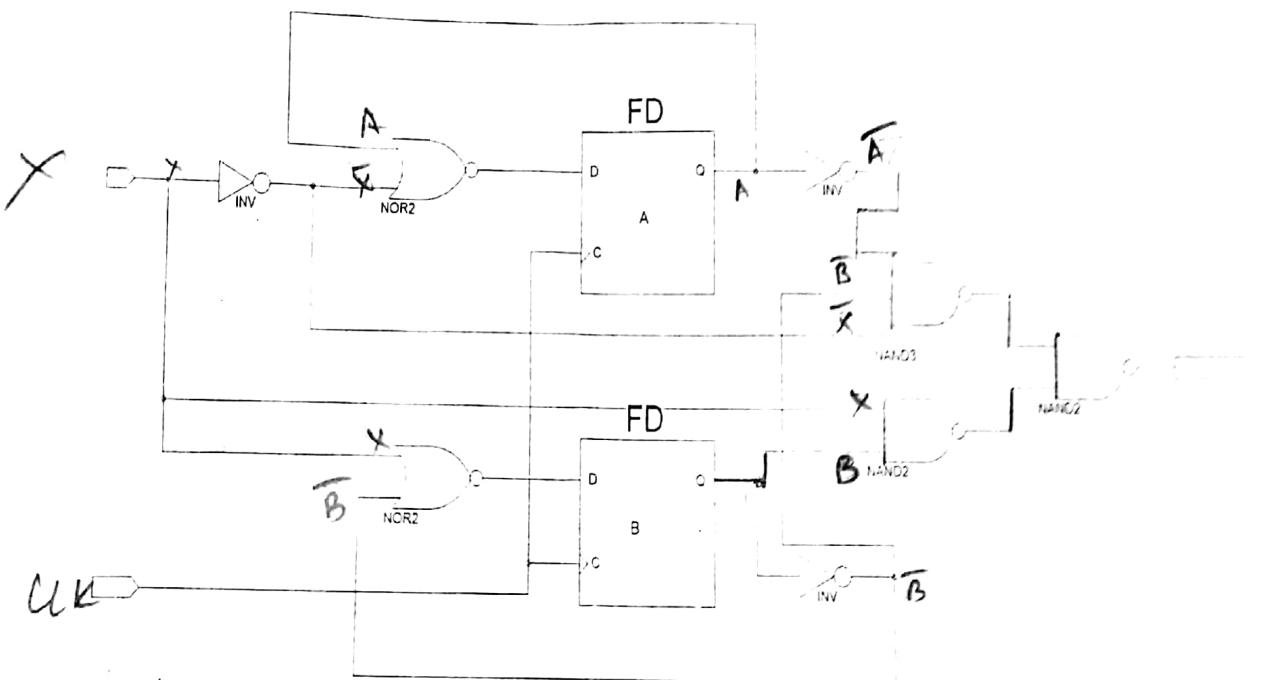


Fig.1

2. Design a Gate level Asynchronous sequential circuit for a Binary Toggle Switch (Fig.2) that changes state with each rising-edge of the clock input. -05-

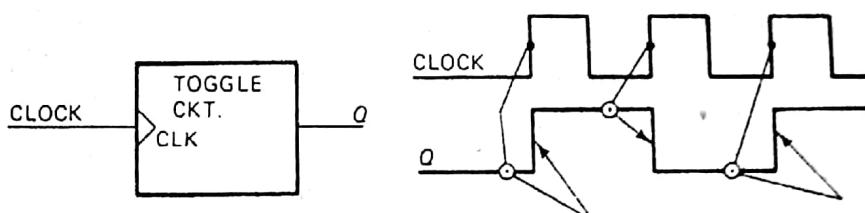


Fig.2

3. A sequential circuit has two inputs, W1 and W2, and an output Z. Its function is to compare the input sequences on the two inputs. If W1=W2 during any four consecutive clock cycles, the circuit produces Z=1; otherwise Z=0. Overlapping of input bits for more than one sequence detection is allowed and is to be considered. Use D F/F and direct logic gates. -05-

4. Design a control network supported with a counter for a 2's complement 4-bit fast multiplier for multiplying signed fractions. Realize the state diagram. The counter output -10-

represents the state of the control network. Design NSD and OD using NAND gates. Draw the schematics of final design.

-10-

5. Develop a Dice Game Controller consisting of Microprogram memory and an input Mux. Build Detailed flow diagram, First cut flow diagram [SM charts], MDS state diagram [State graph] and ROM table of control memory. Consider Moore Outputs having one Test per state. The bare bone block diagram of Dice game is shown in Fig.5.

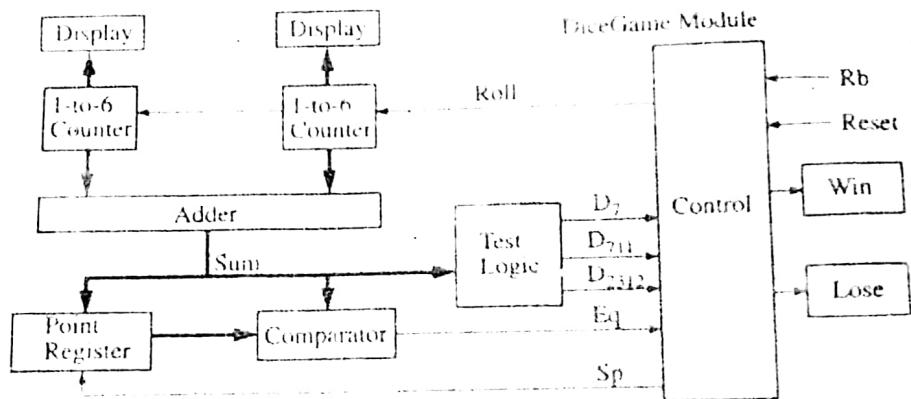


Fig.5.

The input to Dice game come from roll button 'Rb' and new game is initiated by Reset. When roll button is pushed, the dice counters count. After the "roll" of the dice which are simulated as counters, the sum of the values will be in the range 2 through 12. The rule of the game are as follows:

- After the first roll of the dice, the player wins if the sum is 7 or 11. The players loses if the sum is 2,3, or 12. Otherwise, the sum obtained on the first roll is referred as a point, and it is desired to roll the dice again.
- On the 2nd or subsequent roll, the player wins if the sum equals the point and player loses if the sum is 7. Otherwise the player must roll again until he/she loses or wins.

When the roll button is released, counter values are displayed and game can proceed. If Win light / Lose light is not on, the player must push the roll button again.

-20-

Q.5. The intensity of light at a given point is given by the relationship $I = \frac{C}{D^2}$, where C is the candlepower of the source and D is the distance that the source is from the given point. Suppose that C is uniformly distributed over $(1, 2)$, while D is continuous random variable with pdf $f(d) = e^{-d}$, $d > 0$. Find the pdf of I , if C and D are independent random variables.

Q.6. Two fair dice are thrown. Let X_1 be the score on the first die and X_2 be the score on the second die. Let $Y = \max(X_1, X_2)$.

- (a) Find the joint probability distribution of X_1 and Y
- (b) Find the $E(Y)$, $V(Y)$ and $\text{Cov}(X_1, Y)$

Q.7. (a) Given X is random variable with $E(X) = \mu$ and $V(X) = \sigma^2$, find the approximate expressions for $E(Y)$ and $V(Y)$ when $Y = H(X)$.

(b) Suppose that (X, Y) is uniformly distributed within the triangle with vertices $O(0, 0)$, $A(-1, 3)$ and $B(1, 3)$. Obtain $E(X^2)$ and $E(Y^2)$.

Q.8. Let X and Y be independent random variables defined by:

$$\begin{aligned} f(x) &= 4ax; & 0 \leq x \leq r & \text{and} & g(y) &= 4by; & 0 \leq y \leq s \\ &= 0; & \text{otherwise} & & &= 0; & \text{otherwise} \end{aligned}$$

where a and b are constants. If $U = X + Y$ and $V = X - Y$, find the correlation coefficient of U and V in terms of a and b .

Q.9. (a) Find the moment generating function of the random variable X which follows $N(\mu, \sigma^2)$.
 (b) Use the moment generating function (MGF) to show that if X and Y are independent random variables with distribution $N(\mu_x, \sigma_x^2)$ and $N(\mu_y, \sigma_y^2)$, respectively, then $Z = aX + bY$, (a, b are constants) is also normally distributed.

Q.10. (a) Let X be the outcome when a fair die is tossed. Find the moment generating function of X and hence find $E(X)$ and $V(X)$ using the MGF.

(b) Suppose that $M(t)$ is a MGF of some random variable. Which of the following are MGF of some (other) random variables. Justify your answer:

- (i) $M(t)M(5t)$
- (ii) $2M(t)$
- (iii) $e^{-t}M(t)$



Register No.:	1	4	E	E	2	0	5
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Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal

EVEN Semester (2016- 2017)

Course Code: MA208

Date: 18/04/2017

Examination: END SEM

Course Name: Probability Theory & its Applications

Time: 2.00 PM to 5.00 PM

Maximum Marks: 100

INSTRUCTIONS:

1. Answer ALL questions.
2. Rough work should NOT be done anywhere on the Question Paper.

Q.1. (a) Given a class of 12 girls and 10 boys [5]

- (i) What is the probability that a committee of five, chosen at random from the class, consists of three girls two boys?
- (ii) What is the probability that a committee of five, chosen at random from the class, consists of only girls?

(b) Let X follow binomial distribution with parameters n and p . Prove that if the number of trials, n is large and $np = \alpha$ (i.e., α is a constant), then X follows Poisson Distribution.

Q.2. (a) Suppose the number of hits a website receives in any interval is a Poisson random variable. A particular site gets on average 5 hits per seconds. [3]

- (i) What is the probability that there will be none hits in an interval of two seconds?
- (ii) What is the probability that there is atleast one hit in an interval of one second?

(b) A representative from the Indian Premier League's (IPL) marketing division randomly selects people on a random street in Mumbai until he finds a person who attended the last home IPL game of the team Mumbai Indian. Let the probability that he succeeds in finding such a person, equal 0.2. Then

- (i) What is the probability that the marketing representative (MR) must select 4 people before he finds one who attended the last home IPL game?
- (ii) What is the probability that the MR must select more than 6 people before he finds one who attend the last home IPL game?
- (iii) How many people should we expect the MR needs to select before he finds one who attended the last home IPL game? and, while we are at it, what is the variance?

Q.3. (a) The distribution of the number of acres burned by forest and range fires per year in Bannerghatta forest follows Normal distribution. An investigating officer suggested to the forest officer that the probability that upto 4067.5 acres are burnt this year is said to be 38%. Given that the standard deviation of this distribution is 750 acres, what is the probability that between 2,500 acres and 4200 acres will be burned in any given year? [3]

(b) Define Exponential distribution. Find the CDF, Mean and Variance of exponentially distributed random variable.

Q.4. (a) Let X be exponential random variable with variance 25. [3]

- (i) What is the pdf of X ?
- (ii) Find out $E(X^2)$?
- (iii) Find out $P(X > 5)$?

(b) Show that $E(X) = E[E(X|Y)]$ where X and Y are two discrete random variables.

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL
SCHOOL OF MANAGEMENT

Register No.

1	4	E	E	2	0	5
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SIXTH SEMESTER B.TECH DEGREE
END-SEMESTER EXAMINATIONS, APRIL/MAY -2017
HU – 302 PRINCIPLES OF MANAGEMENT

I. Answer all questions: (5 x 6 = 30 marks)

1. "The controlling function of management is similar to the function of the thermostat in a refrigerator". Comment.
2. Explain the circumstances under which a matrix organizational structure is applicable.
3. 'Planning is a continuous process and also facilitates control'. Comment.
4. Scanning of the external environment is very essential for any company. Comment.
5. Management is both a science and an art. Comment.
6. Communication is vital for any organization. Discuss the importance and also highlight the types of communication.

II. Answer all questions: (10 x 5 = 50 marks)

1. "Motivation is core of management". Discuss what management can do to motivate the staff in an industrial organization?
2. Explain McGregor's Theory X and Theory Y. How is theory Y an improvement over the traditional view that you can motivate employee by paying them more money?
3. "The most effective leaders show great concern, both for task and for people." Comment on the validity of this statement.
4. A software company is looking for software engineers to be based in its Bangalore offices. You are required to help the company in devising the Human Resource Management process using the systems approach for the company.
5. Explain the strategic management process in detail.

III. Read the case and answer the questions given below

(20 marks)

Mahak Singh joined Syndicate Bank, Meerut branch as a clerk "after obtaining the post-graduate degree in chemistry from Delhi University in 1986. He did his work with due diligence and was generally rated as a hard-working, ambitious young man. He obtained the professional qualification, CAIIB, in 1992. Therefore, he had applied for the officers' post under the promotion quota. He could not get the promotion as his scores in the written test were low. Meanwhile, he is transferred to the Delhi University, Campus branch, Delhi. His attempts to scale the career ladder, did not succeed and after several frustrating traits Is, he consciously decided to join the ranks of the union as an active member. He became the president of the local branch of Bank Employees' Union in 1995. Through his interpersonal skills, he moved closer to most employees in the bank and is able to put out the fires between people quickly. Of late, he is considered a touch union activist to bargain with and management has developed a kind of negative attitude towards his career moves. In 1996, when the opportunity came, he was not considered for promotion as his interview scores, these times were found to be not satisfactory! The branch managers' confidential report about his union activities, it is rumoured, is said to be the major obstacle to his promotion. Meanwhile, Mahak Singh started a business of dealership in automobiles using a dummy name. He has also succeeded, to a large extent, in diverting the deposits of nearby business community to other banks. Based on the recommendations of the new branch manager, management has decided to promote Mahak Singh to the office cadre in 1999. Mahak Singh received the appointment order for the officer's post from the head office recently. The colleagues, along with the Branch Manager planned an evening tea party, congratulating his achievement. To their surprise, Mahak Singh expressed his unwillingness to accept the offer and refused the promotion straight away, citing medical reasons.

Answer the following questions: -

- (i) Comment on the promotion policy of the bank, using inputs from the above case.
- (ii) Do you think management's action of selecting Mahak Singh as an officer after 13 years of service is in the right direction? Why and why not?
- (iii) Why did Mahak Singh refuse promotion?
- (iv) What would you have done if you had been Mahak Singh?

Even Semester (2016- 2017)
 Course Code: MA204
 Date: 21/04/2017

Time: 9.00 AM to 12.00 PM

Examination: End Sem
 Course Name: Linear Algebra and Matrices
 Maximum Marks: 100

IMPORTANT INSTRUCTIONS:

1. Answer ALL questions.
2. Rough work should NOT be done anywhere on the Question Paper.
3. The first 10 questions can have more than one correct answer. Encircle the correct choice(s). If a multiple choice question is of M marks and it has N correct answers, value of a correct answer is M/N and value of a wrong answer is $-M/N$. But if net marks is negative, then 0 is awarded.

Q.11. Solve the following system of equations using row transformation [10]

$$x_1 + 3x_2 + 2x_3 + 4x_4 - 3x_5 = -7$$

$$2x_1 + 6x_2 - x_4 - 2x_5 = 0$$

$$6x_3 + 2x_4 - x_5 = 12$$

$$x_1 + 3x_2 - x_3 + 4x_4 + 2x_5 = -6$$

Q.12. (a) Define a real quadratic form and show that every real quadratic forms can be expressed as $x^T B x$ where B is a real symmetric matrix. [04]

(b) Find the rank and signature of the following quadratic forms. [06]

$$(a) x^2 - 3y^2 - 8z^2 - t^2 + 2xy - 2xz + 2xt - 14yz + 10yt + 10zt.$$

Q.13. State and prove rank-nullity Theorem. [10]

Q.14. Show that the eigenvalues of a real symmetric matrix are real and the eigen vectors corresponding to distinct eigenvalues are orthogonal. [10]

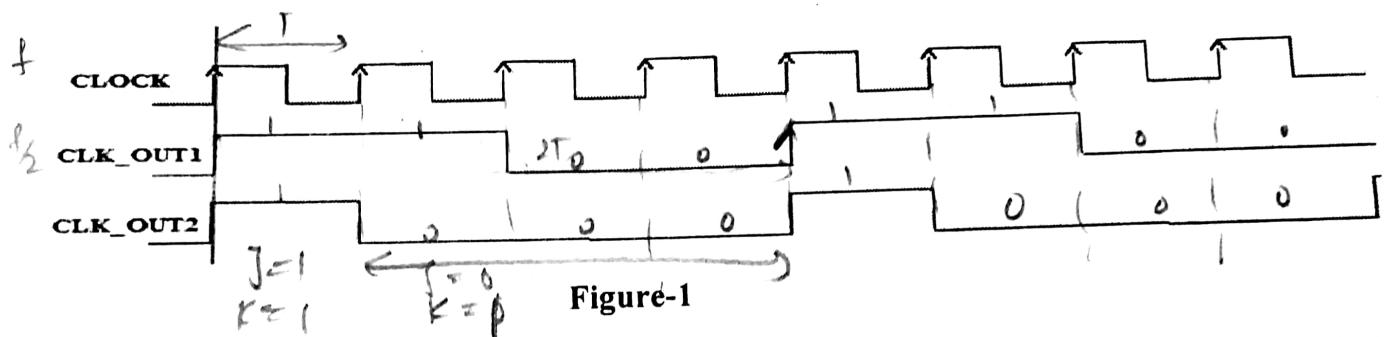
Q.15. Find the matrix of the following transformation [10]

$T : \mathbb{R}^5 \rightarrow \mathbb{R}^3$ given by $T((x, y, z, s, t)) = (x+2y+2z+s+t, x+2y+3z+2s-t, 3x+6y+8z+5s-t)$ with respect the basis

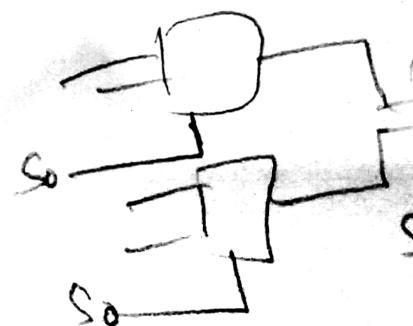
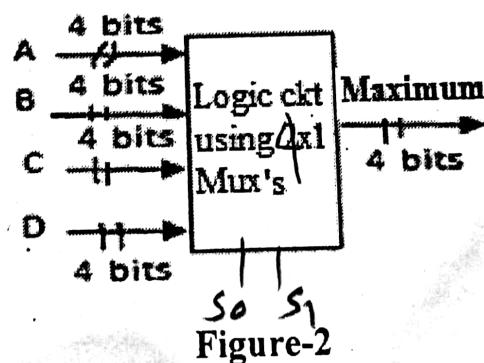
$E = \{(-1, 1, 1, 1, 1), (1, -1, 1, 1, 1), (1, 1, -1, 1, 1), (1, 1, 1, -1, 1), (1, 1, 1, 1, -1)\}$ for \mathbb{R}^5 and $B' = \{(1, 2, 2), (2, 1, 2), (2, 2, 1)\}$ basis for \mathbb{R}^3 .

DSD LAB MID-SEM TEST

Q-1. Design a Logic Circuit which generates the following CLK_OUT1, CLK_OUT2 shown in figure below from CLOCK as input. Design it by using Schematic Approach. Demonstrate the waveform shown here in your simulation results. **10M**



Q-2. Describe a 4-to-1 Multiplexer in verilog. Using these mux instances design a logic circuit that finds maximum of 4, four bit inputs A, B, C, D and keeps that value in the output REGISTER called "Maximum". Logic Block Diagram is shown in Figure 2. Demonstrate the output using a TB. **10M**



VI SEMESTER B.Tech. (E & E) MID SEM EXAM, FEB 2017

EE311: DIGITAL SYSTEM DESIGN, (Credit Scheme), Ele

Duration: 1 1/2 Hours

Weightage: 25%

Maximum Marks: 25

1. Analyze the sequential circuit shown in Fig.1 below.

-05-

2. A Moore sequential circuit has one input and one output. The output goes to 1 when the input sequence 111 has occurred, and the output goes to 0 if the input sequence 000 occurs. At all other times, the output holds its value. Design this clocked sequential circuit and realize hardware using mixed logic gates and D F/F.

Hint: $X = 01011101000111001000$
 $Z = 000000111110001111110$

-10-

3. A sequential circuit has one input (X) and two outputs (D and B). X represents a 4-bit binary number N, which is input least significant bit first. D represents a 4-bit binary number equal to $(N - 2)$, which is output least significant bit first. At the time the fourth input occurs, $B = 1$ if $(N - 2)$ is negative; otherwise, $B = 0$. The circuit always resets after the fourth bit of X is received. Design a Mealy state machine with J-K Flip flops and NAND gates. Let machine have minimum number of states (6 states) and follows state assignment rules.

-10-

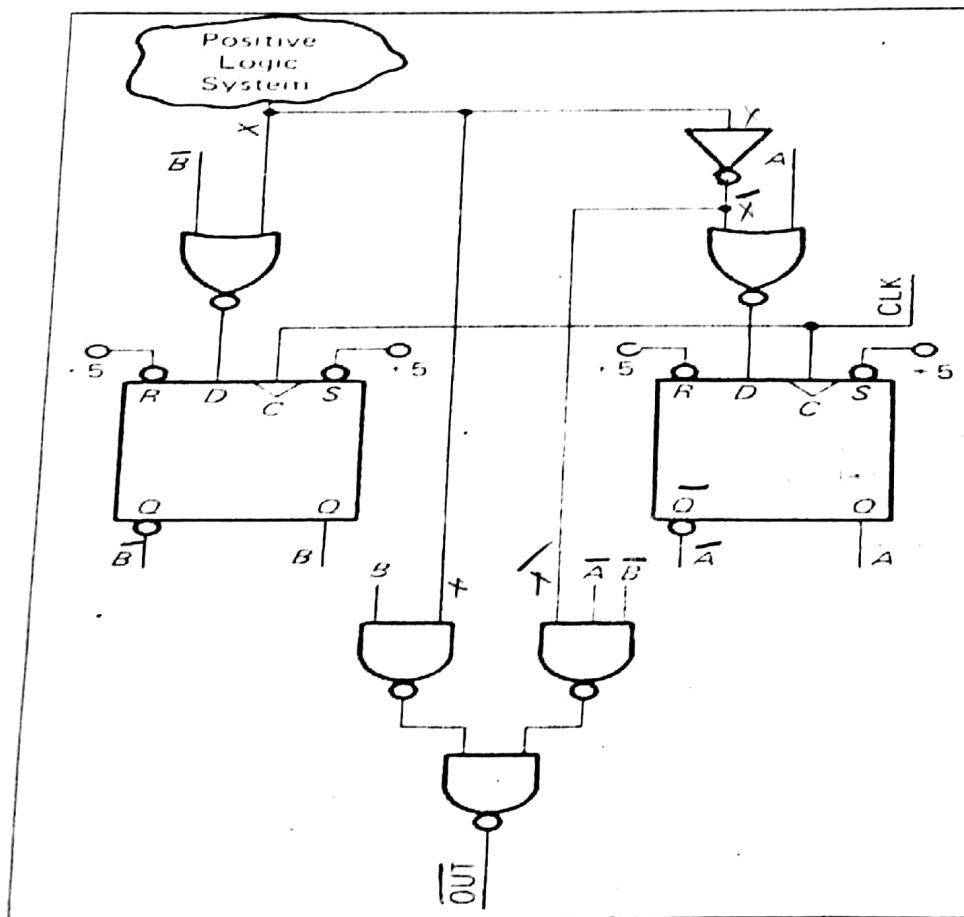


Fig.1



Register No.: 1 4 E E 2 0 5

Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal

EVEN Semester (2016- 2017)

Course Code: MA208

Date: 18/02/2016

Examination: MID SEM

Course Name: Probability Theory & its Applications

Time: 10.30 AM to 12.00 Noon

Maximum Marks: 50

INSTRUCTIONS:

1. Answer ALL questions. 2 Rough work should NOT be done anywhere on the Question Paper.

- Q.1. (a) Assume A and B are independent events with $P(A) = 0.2$ and $P(B) = 0.3$. Let C denote the event that none of the events A and B occurs, and let D denote that exactly one of the events A and B occurs. Find (i) $P(C)$ (ii) $P(D)$ (iii) $P(A|D)$ [5]
- (b) Define Cumulative Distribution Function (CDF) of a random variable. A fair coin is tossed for n times. Define the random variable X such that [5]

$$X(\omega) = \text{number of heads occur in } \omega \in \Omega$$

where Ω is the associated sample space. Find and sketch the CDF, F_X of X .

- Q.2. (a) A total of 600 of the 1,000 people in a retirement community classify themselves as Republicans, while the others classify themselves as Democrats. In a local election in which everyone voted, 60 Republicans voted for the Democratic candidate, and 50 democrats voted for the Republican candidate. If a randomly chosen community member voted for the Republican, what is the probability that she or he is a Democrat? [5]
- (b) A communication system consists of n components, each of which will, independently, function with probability p . The total system will be able to operate effectively if atleast one-half of its components function. For what value of p is a 5-component system more likely to operate than a 3-component system? [5]
- Q.3. (a) Consider a random variable X with possible outcomes: 0, 1, 2, Suppose that $P(X = j) = (1 - a)a^j$; $j = 0, 1, 2, \dots$ [5]
- (i) For what values of a , the above does represent a legitimate probability distribution.
 - (ii) Show that for any two positive integers s and t , $P(X > s + t | X > s) = P(X \geq t)$
- (b) The average number of chocolates a nine year old child eats per month is uniformly distributed from 0.5 to 4 chocolates, inclusive. [5]
- (i) Find the PDF (Probability Density Function) and CDF of the above distribution.
 - (ii) Find the probability that a randomly selected nine-year old child eats an average of more than two chocolates.
 - (iii) Find the probability that the child eats an average of more than two chocolates given that his or her amount is more than 1.5 chocolates.

- Q.4. (a) Define PDF of a continuous random variable X . [5]

- (i) Does the function

$$f(x) = \begin{cases} x - 3 & \text{for } 3 < x \leq 4 \\ 5 - x & \text{for } 4 \leq x \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

define PDF of a random variable X ?

- (ii) Find the CDF associated with $f(x)$ and sketch both PDF and CDF.
- (b) Suppose that X is uniformly distributed over $(-1, 1)$. Find the PDF of the following random variables (i) $Y = \sin(\frac{\pi}{2})X$ (ii) $W = |X|$
- Q.5. (a) During Chennai floods claim amounts to insured homes are independent random variables with common probability density function

$$f(x) = 3x^{-4} \quad \text{for } x > 1; \quad 0 \quad \text{otherwise}$$

where x is the amount of a claim in thousands. Suppose 3 such claims will be made. Obtain the probability density function of the largest of three claims.

- (b) If $Y = H(X)$ is decreasing function of the random variable X with pdf $f(x)$ defined on the interval $a < x < b$ then obtain the form of the pdf of the random variable Y and hence find the probability density function of the random variable $Y = \frac{1}{X}$, if the random variable X follows the Cauchy pdf $f(x) = \frac{1}{\pi(1+x^2)}$; $-\infty < x < \infty$.
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**NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL
SCHOOL OF MANAGEMENT
MID SEMESTER EXAMINATION, FEBRUARY - 2017
HU 302- PRINCIPLES OF MANAGEMENT (POM)
VI SEMESTER – B.TECH**

Note: Enter the roll number in the box provided.

Roll No.

14EE205 .

Time: 1 hour 30 minutes

Marks: 50 Maximum

Section – A

(6 X 5 = 30 Marks)

Answer all questions in about 150 words.

1. Discuss the steps in planning. Illustrate the same with an example.
2. Explain classical and contemporary views of management
3. Administration is a “thinking function” than a “doing function”. Elucidate.
4. Write a note on corporate social responsibility.
5. Explain the relevance of the BCG Matrix as a resource allocation tool.
6. Discuss in brief the various modes of market entry strategies with examples.

Section – B

Answer the following in about 300 words:

(1 X 10 = 10 Marks)

7. How are the Fayol's Principles of Management different from the Hawthorne experiments? Which one according to you is more applicable in the present day business and why?

Section – C

(1 X 10 = 10 Marks)

8. **Read the case and answer the question given below**

Case Study: Fish Out of the Pond

Sundeep Mulye has finished the ITI diploma from a leading technical institute in Delhi in 1998. He has joined as a trainee in Shanker Foams (P) Ltd. on the strength of his brilliant interview performance. He was asked to report to Suresh Kumar, the warehouse supervisor, immediately after the interview. On the first day, Suresh assigned Mulye to small group of 8 workers who were responsible for loading trucks that supplied the materials and carried back the foam

mattresses, furniture, pillows, bolsters, cushions, bus seats, sheets, etc. to various marketing centres.

Being a technician, Mulye was basically surprised to find workers not doing things properly. They were carrying out instructions, no doubt, but at a slow pace, including in gossip and even playing "hide and seek" wherever there was lot of work to do. Mulye often found himself alone unloading the trucks while other members of the group were off messing around elsewhere. Mulye was quick to indicate this to his crew members. He said, 'I do not like this kind of waste in the workplace. You must be sincere to your job. Instead of standing around and talking, why don't you assist me in the unloading operations? Don't you think, by wasting your time on useless activities you are also cutting off the profits and consequently your own bonus packages? The workers on this part were quick to retort: "if you don't like our company, better hang out outside. If you plan to complain, you better hold your tongue and indecent haste. Otherwise you may have cause to feel sorry later on".

After the unhappy exchange of arguments and counter arguments, the crew virtually boycotted Mulye from their social network, such as taking tea and lunch together, celebrations on Friday afternoon, weekend movies, celebration of festivals in company quarters, street side card games, etc. Being a bachelor, Mulye found this a bit too hard and, one day, picked an argument with Shanker Dada, one of the older workers thus:

What's wrong with you guys? I am just trying to do my job. I am paid for the work here. I don't want to be a parasite on the company and I don't like others to run around without a spot on their shirts. Anyway I am not going to stick my neck out for long here. I am glad that you guys have not been able to change me a bit.

Shanker Dada replied Comrade Mulye, if you had been here as long as we have, you would be just like us.

Question:

1. Employing some of the theories, do you agree with Shanker Dada's statement? Why or why not? Elucidate.

Department of Electrical and Electronics Engineering
 National Institute of Technology Karnataka, Surathkal
 Mid Semester Examination
EE-350 Power System Engineering-II

B.Tech. (6th Semester)

Marks: 50

Duration: 1 Hr 30 Minutes

Note: Make suitable assumptions, wherever necessary.

IUEE205

Session: January – May, 2017

Date: 15th February 2017, 1.30 to 3.00 PM

- 1) Derive the model of a transformer provided with an OLTC (on load tap changer) arrangement for load flow studies as shown in Fig. 1. Prove that when turns ratio 'a' is complex, the bus admittance matrix Y-bus of the system becomes unsymmetrical. (10)

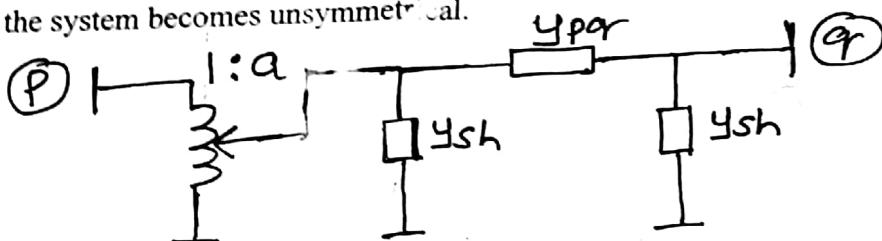
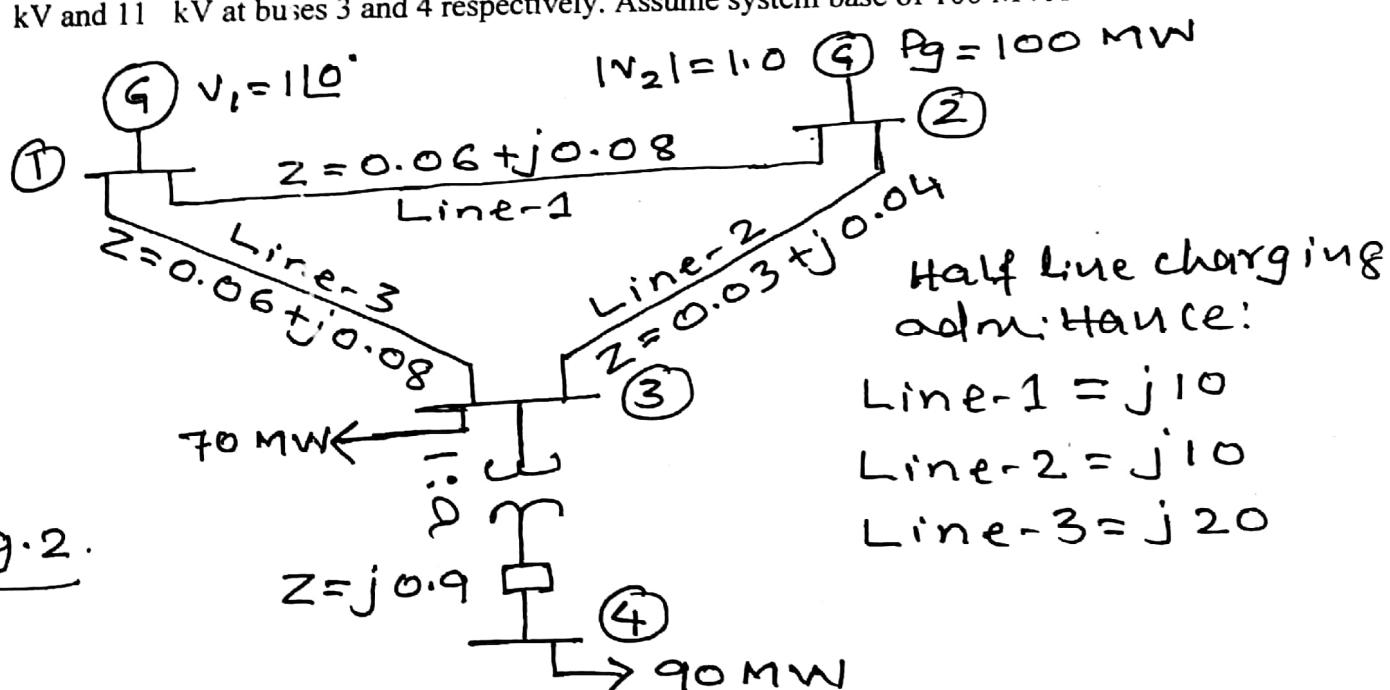


Fig. 1

- 2) A sample 4-bus system is described in Fig. 2. The line and transformer parameters are indicated on 100 MVA base. Transformer has tap towards bus-4 and turns ratio (a) is set at 0.909. For this system form Y-bus. What will be the modification in the Y-bus computed above if two shunt elements of $j4.0$ ohm (inductor) and $-j4.0$ ohm (capacitor) are connected at buses 3 and 4 respectively? Consider voltage base of 22 kV and 11 kV at buses 3 and 4 respectively. Assume system base of 100 MVA (10)



- 3) Starting with the expression for real and reactive power at a node (no derivation needed), obtain the expression for the following Jacobian elements of the rectangular version of the Newton Raphson (NR) iterative method. (10)

a) $\frac{\partial P_k}{\partial e_m}$ for $k \neq m$ b) $\frac{\partial P_k}{\partial e_k}$ c) $\frac{\partial Q_k}{\partial e_k}$ and d) $\frac{\partial Q_k}{\partial e_m}$ for $k \neq m$

- 4) The one-line diagram of an unloaded power system shown in Fig. 3. Reactance of the two sections of transmission line is shown one-the diagram. The generators and transformer are rated as follows:
- G1: 20 MVA, 13.8 kV, $x'' = 0.2$ pu
 G2: 30 MVA, 18 kV, $x'' = 0.2$ pu
 G3: 30 MVA, 20 kV, $x'' = 0.2$ pu
 T1: 25 MVA, 220Y/13.8Δ kV, $x = 10\%$
 T2: Single phase units each rated 10 MVA, 127/18 kV, $x = 10\%$
 T3: 35 MVA, 220Y/22Y kV, $x = 10\%$
- Draw the impedance diagram with all reactances marked in per unit (pu) and with letters to indicate points corresponding to the one-line diagram. Choose a base of 50 MVA, 13.8 kV in the circuit of Generator-1.

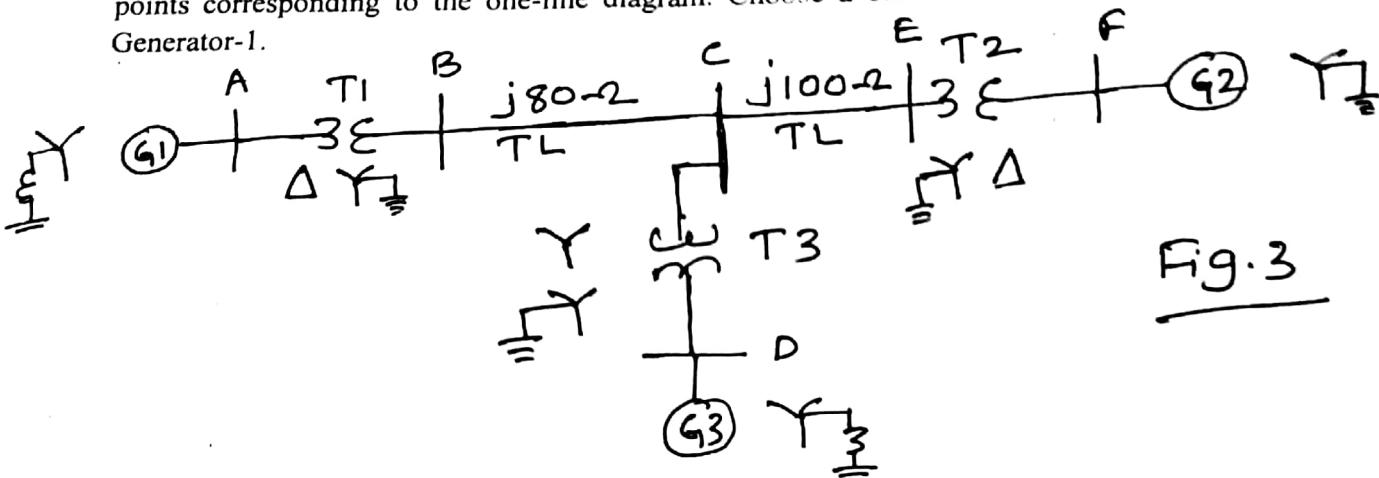


Fig. 3

- 5) For the system shown in Fig. 4, determine the phasor values of the voltage at the load bus-3 using Gauss-seidel method. Perform one iteration and then find real and reactive power at slack bus and line flows. Assume system base is 100 MVA.

(10)

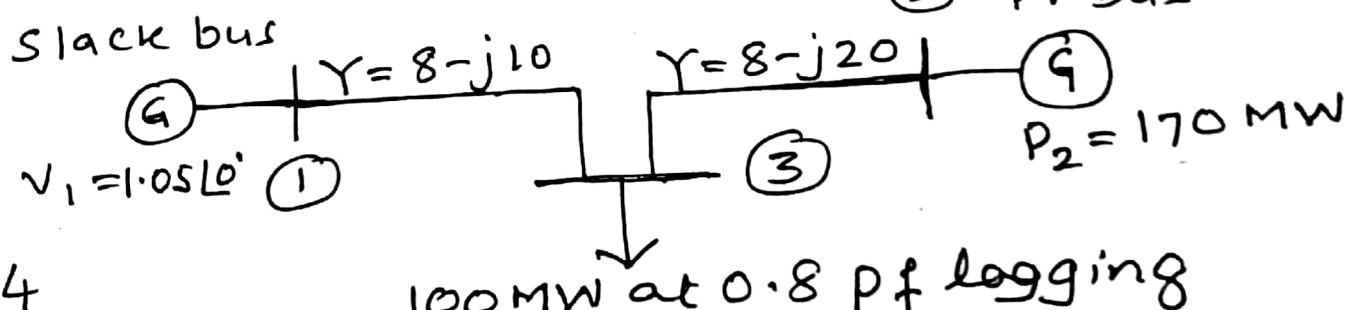


Fig. 4

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