

POKHARA UNIVERSITY

Level: Bachelor

Semester – Fall

Year : 2013

Programme: BE

Full Marks: 100

Course: Probability and Queuing Theory

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) In an organization , there are 2 Civil engineers, 4 IT officers and 2 accountants. A committee of four members has to be formed. What is the probability that a committee contains i) one Civil engineer and 3 IT officers ? ii) no civil engineer iii) no Civil engineer? no Civil engineer? iii) at least one IT officers? 7

- b) A consulting firm rents cars from three agencies, 20% from agencies D, 20% from agencies E and 60% from agencies F. It is experienced that 10% of the cars from D, 12% of the cars from E and 4% of the cars from F have bad tyres. What is the probability that the firm will get the car with bad tyres? Also what is the probability that a car with bad tyres rented by firm came from agency F? 8

2. a) The joint probability density function of two dimensional random variable (X, Y) is given by 8

$$f(x, y) = \begin{cases} \frac{2}{3}(x + 2y); & 0 < x < 1, 0 < y < 1 \\ 0; & \text{otherwise} \end{cases}$$

- i. Find marginal probability density function of X and Y.
- ii. Find conditional probability density of X given $Y = y$.
- iii. Examine whether X and Y are independent.

- b) Given that the switchboard of a consultant's office receives on the average of 0.6 calls per minute, find the probabilities that 7
- i. In a given minute there will be at least 1 call

- ii. In a 4-minute interval there will be at least 3 calls.
 iii. At least 4 of 12 such tubes
3. a) In an intelligence test administered on 1000 children, the average was 60 and the standard deviation was 20. Assuming that the marks obtained by the children follow a normal distribution, find the number of children who have scored
- Over 90 marks
 - Below 40 marks
 - Between 50 and 80 marks
- b) Interpret Chebyshev's inequality. Suppose that a balanced coin tosses many times. Estimate how many times must the coin be tossed so that the probability will be at least 0.90 that the proportion will lie in between 0.4 and 0.6.
4. a) Define Stochastic Process and Markov Process. Why an exponential distribution is called memoryless? Explain.
- b) Assume that a computer system is in one of three states: busy, idle, or undergoing repair, respectively denoted by states 0, 1, and 2. Observing its state at 2 P.M each day, we believe that the system approximately behaves like a homogeneous Markov chain with the transition probability matrix
- $$P = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0.0 & 0.4 \end{bmatrix}$$
- Prove that the chain is irreducible, and determine steady state probabilities.
5. a) Cars arrive at a petrol station having only one petrol unit in Poisson fashion with an average of 10 cars per hour. The service time is distributed exponentially with a mean of 3 minutes. Find
- The average number of cars in the system
 - Average time a car spends in the queue
 - The probability that there will be two cars in the system.
- b) A group of telephone subscribers is observed continuously during an

80-minute busy hour period. During this time they make 30 calls, with the total conversation time being 4200 seconds. Compute

i. average no. of telephone subscribers in the system

ii. average time a unit spends in the system

5. a) Suppose in a season, days can be modeled as wet and dry. The transition from a wet day to dry is having chance of 20%, and that of dry to wet is 50%. If the transitions are considered as homogeneous Markov Chain, what is the probability that a day will be dry after five days? similarly, what is the probability that a day will be wet after six days? 7
- b) During 8:00- 10:00 AM each morning, train arrives every 20 minutes in a yard. The Service times have an average of 36 minutes for each train. If the capacity of the yard is 4 trains only, find 8
- The probability that the yard will be empty
 - the average queue size

6. Write short notes on any two: 2×5

- Bayes Rule
- Binomial Distribution
- Periodicity of a Markov chain

(3)

P&T-13 Fall

$$f(x) = \begin{cases} \frac{1}{20} e^{-\frac{x}{20}} & \text{for } x > 0 \\ 0 & \text{for } x \leq 0 \end{cases}$$

Find the probabilities that one of these tries will last

- i. at most 10,000 miles
- ii. anywhere from 16,000 to 24,000 miles
- iii. at least 30,000 miles

3. a) The marks 500 candidates in an examination are normally distributed with a mean of 45 marks and standard deviation 20 marks. 8
- i. Given that the pass mark is 40, estimate the number of candidates who passed the examination
 - ii. If 5% of the candidates obtain a distinction by scoring x marks or more, estimate the value of x .
- b) Interpret Chebyshev's inequality. Suppose that a balanced coin is tossed many times. Estimate how many times must the coin be tossed so that the probability will be at least 0.90 that the proportion will lie in between 0.4 and 0.6 7
4. a) If two independent samples of size $n_1=26$ and $n_2=8$ are taken from a normal population, what is the probability that the variance of the first sample will be at least 4 times as large as the variance of the second sample? 7
- b) The capacity of a communication channel is 2,000 bits per second. This line is used to transmit eight bit characters, so the maximum rate is 250 characters per second. The application calls for traffic from many devices to be sent on the line with a total volume of 12,000 characters per minute. Calculate the traffic intensity and average no. of characters waiting to be transmitted 8
5. a) A telephone exchange receives one call every 4 minutes and each call lasts an average of 3 minutes. If the rate of arrival of the call follows Poisson distribution and the service time follows exponential distribution; Calculate 7
- i. expected waiting time in the queue
 - ii. expected time in the system
- b) A supermarket has two girls ringing up sales the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive in a Poisson fashion at the rate of 10 an hour, calculate 8

POKHARA UNIVERSITY

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Programme: BE

Course: Probability and Queuing Theory

Semester: Spring

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Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) A given lot of IC chips contains 2 percent defective chips. Each chip is tested before delivery. The tester itself is not totally reliable so that $P(\text{"Tester says chip is good"}/\text{"chip is actually good"})=0.95$ and $P(\text{"Tester says chip is defective"}/\text{"chip is actually defective"})=0.94$. If a tested device is indicated to be defective, what is the probability it is actually defective? 8
- b) It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least one third. Accordingly, what are the probabilities that the utility bill will be reduced by at least one third in
 - i. four of five installation
 - ii. at least four of five installations7
2. a) A random variable has the probability density function $f(x) = \frac{1}{2}e^{-x/2}, x > 0$. find the mean and variance. 7
- b) Let the phase error in a tracking device has probability density

$$f(x) = \begin{cases} \cos x & 0 < x < \frac{\pi}{2} \\ 0 & \text{elsewhere} \end{cases}$$
8

Find the probability that the phase error is

 - i. Between 0 and $\frac{\pi}{4}$
 - ii. grater than $\frac{\pi}{3}$

Or

The mileages (in thousands of miles) that car owners get with a certain kind of tire is a random variable having the probability density

- i. Probability of having to wait for service
ii. Expected percentage of idle time for each girl
- a) Let $\{X_n, n \geq 0\}$ be a matrix chain defined on the 3 states 0, 1 and 2. Its transition probability matrix is given below. Let the initial distribution be
- $$P(X_0 = i) = \frac{1}{3} \forall i = 0, 1, 2 \text{ obtain } p(X_2 = 1, X_0 = 0)$$
- b) The transition of wet and dry days in a town is modeled by using a homogeneous M C with the Following transition probability matrix
 $P = \begin{pmatrix} 0.8 & 0.2 \\ 0.5 & 0.5 \end{pmatrix}$ What is the probability that it will dry after five days?
- Write short notes on: (Any two) 2x5
- a) Baye's Rule
b) Memory less property of exponential distribution
c)

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NCIT College

POKHARA UNIVERSITY

Level: Bachelor	Semester: Fall	Year : 2014
Programme: BE		Full Marks: 100
Course: Probability and Queuing Theory		Pass Marks: 45
		Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) An assembly plant receives its voltage regulators from three different suppliers, 60% from supplier A, 30% from supplier B, and 10% from supplier C. If 95% of the voltage regulators from A, 80% of the voltage regulators from B, and 65% of those from C perform according to the specification given by the suppliers. What is the probability that:
- i. The assembly plant will receive voltage regulator working according to the specification.
 - ii. If a selected voltage regulator is found to be not working according to the specification,
What is the probability that it was supplied by supplier C?
- b) The joint density function of X and Y is given by $f(x, y) = Kxy$, if $0 < x < 2, 0 < y < 4$ and 0 elsewhere 7
Find:
 - i. The value of the constant K
 - ii. Find $P(X \geq 1, Y \leq 2)$
 - iii. Find the marginal density function of X and Y
 - iv. Check if X and Y are independent.
2. a) It is known that 5% of the screws manufactured by an automatic machine are defective. If a sample of 20 screws is selected at random, find the probability that the sample contain:
 - i. Exactly 2 defective screws.
 - ii. At least 2 defective screws.
 - iii. At most 2 defective screws.8

- iv. No defective screws.
- b) At a checkout counter customers arrive at an average of 1.5 per minute. Find the probabilities that
- At most 4 will arrive in any given minute.
 - At least 3 will arrive during an interval of 2 minutes.
 - At most 15 will arrive during an interval of 6 minutes.
3. a) The length of time a person speaks over phone follows exponential distribution with mean 6. What is the probability that the person will talk for
- More than 8 minutes.
 - Between 4 and 8 minutes.
- b) The actual amount of instant coffee that a filling machine puts into "4-ounce" jars may be looked upon as a random variable having a normal distribution with standard deviation of 0.04 ounces. If only 2% of the jars are to contain less than 4 ounces, what should be the mean fill of these jars?
4. a) There are three brands of beauty products A, B, and C in a shop. It has been found that a person when purchases a beauty product of a particular brand, will continue to buy the same brand or switch over to another brand during his next purchase of a beauty product in the shop. The transition probability matrix associated with the three brands is given below:

$$P = \begin{pmatrix} 0.4 & 0.3 & 0.3 \\ 0.6 & 0.1 & 0.3 \\ 0.2 & 0.3 & 0.5 \end{pmatrix}$$

If the initial distribution of purchase of the brands A, B, and C is [0.4 0.4 0.2], determine the distribution of the brands after two purchases.

- b) A counter has single attendant. During peak hours, customers arrive at the rate of 20 per hour. The average number of customers that can be served by the attendant is 24 per hour. Calculate:
- The probability that the cashier is idle.
 - The average no. of customers in the system.
 - There are more than 7 customers in the queue.
 - Average waiting time of a customer in the queue waiting for service.

5. a) A petrol pump station has 3 pumps. The service time follow an exponential distribution with mean of 5 minutes and the cars arrive for service in a Poisson process at the rate of 8 cars per hour. Find: 8
- A customer has to wait for service.
 - Average no. of customers waiting in the queue.
 - Average no. of cars in the system.
- b) A television repairman finds that the time spent on a repair has an exponential distribution with mean of 30 minutes. If he repairs the set in the order they come and if the arrival of television set for repair is Poisson with an average rate of 10 per 8 hour day, what is his expected idle time per day? 7
6. a) A single-man barber shop can accommodate maximum of 5 people at a time (4 waiting and 1 getting haircut). Customers arrive in the shop at the rate of 8 per hour and the barber takes 6 minutes for serving each customer. If the arrival process is Poisson and service time is an exponential random variable, find: 7
- Percentage of time the barber is idle.
 - Fraction of potential customers who will be turned away.
- b) Explain the Markovian property of exponential distribution with necessary derivation. 8
7. Write short notes on: (Any two) 2×5
- Chebyshev's Inequality.
 - Birth and Death Process.
 - Conditional Probability.

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Attempt all the questions.

1. a) There are three switches in a college network namely A, B and C working independently. These switches are configured in series so that all switches should be 'on' to have successful transmission of data. The individual probability of being switch 'on' for these are $1/2$, $3/4$ and $1/4$ respectively. Find the probability that
 - i. There will be a successful data transfer
 - ii. There will not be a successful data transfer.7
 - b) A consulting firm rents cars from three agencies, 20% from agency D, 20% from agency E and 60% from agency F. It is experienced that 10% of the cars from D, 12% of the cars from E and 4% of the cars from F have bad tyres. What is the probability that the firm will get the car with bad tyres? Also what is the probability that a car with bad tyres rented by from came firm agency F?8
-
2. a) The joint probability density function of two dimensional random variable (X, Y) is given by8

$$f(x, y) = \begin{cases} \frac{2}{3}(x + 2y); & 0 < x < 1, 0 < y < 1 \\ 0; & \text{otherwise} \end{cases}$$
 - i. Find marginal probability density function of X and Y.
 - ii. Find conditional probability density of X given $Y=y$.
 - iii. Examine whether X and Y are independent.
 - b) Given that the switchboard of a consultant's office receives on the average of 0.6 calls per minute, find the probabilities that7
 - i. In a given minute there will be at least 1 call.
 - ii. In a 4-minute interval there will be at least 3 calls.

- iii. At least 4 calls in 4-minute interval.
3. a) In an intelligence test administered on 1000 children, the average was 60 and the standard deviation was 20. Assuming that the marks obtained by the children follow a normal distribution, find the number of children who have scored
- Over 90 marks.
 - Below 40 marks.
 - Between 50 and 80 marks.
- b) Interpret Chebyshev's inequality. Suppose that a balanced coin tosses many times. Estimate how many times must the coin be tossed so that the probability will be at least 0.90 that the proportion will lie in between 0.4 and 0.6.
4. a) Assume that a computer system is in one of three states: busy, idle, undergoing repair, respectively denoted by states 0, 1 and 2. Observing its state at 2 P.M each day, we believe that the system approximately behaves like a homogeneous Markov chain with the transition probability matrix.

$$P = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0.0 & 0.4 \end{bmatrix}$$

Prove that the chain is irreducible, and determine steady state probabilities.

- b) During 8:00-10:00 AM each morning, train arrives every 20 minutes in a yard. The Service times have an average of 36 minutes for each train. If the capacity of the yard is 4 trains only, find
- The probability that the yard will be empty.
 - The average queue size.
5. a) Let X and Y have the joint probability mass function
- $$f(x, y) = (x + y)/21, x = 1, 2, 3 \text{ and } y = 1, 2$$
- Find marginal probability of X and that of Y .
 - Find conditional probability distribution of X given $Y=2$.
 - Find conditional variance of X when $Y=1$.
- b) The average rate of arrival of customers in a supermarket is 10 every 30 minute. The average time taken by the cashier to list and calculate the customer purchases is 2.5minutes. Suppose that arrivals are assumed to follow Poisson process and service the follow

exponential list? Calculate the OC for this model.

Define Stochastic Process and Markov process. Why an exponential distribution is called memoryless? Explain.

8

The daily consumption of milk in a city is excess of 20,000 gallons, is approximately distributed as a gamma variate with parameters $\alpha = 2$ and $\lambda = \frac{1}{10,000}$. The city has a daily stock of 30,000 gallons. What is the probability that the stock is in sufficient on a particular day?

7

(Note: $\beta = \frac{1}{\lambda}$)

2x5

Write short notes on: (Any two)

- a) Central limit theorem.
- b) Application of Queuing theory in computer science.
- c) Random Variable.

POKHARA UNIVERSITY

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Full Marks: 100

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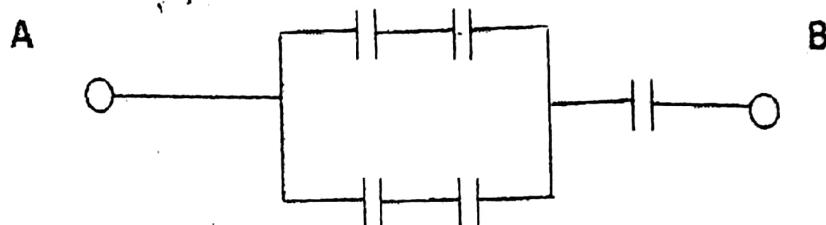
Time : 3 hrs.

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Attempt all the questions.

1. a) For the circuit given below, the probability of closing each relay of the circuit is known to be 0.6. Assume that the relays act independently. What is the probability that a current will exist between the terminals A and B. 7



- b) State Bayes' theorem. An aircraft emergency locator transmitter (ELT) is a device designed to transmit a signal in the case of a crash. The Altigauge manufacturing company makes 80% of the ELTs, the Bryant Company makes 15% of them, and the Chartair Company makes the other 5%. The ELTs made by Altigauge have a 4% rate of defects, the Bryant ELTs have a 6% rate of defects, and Chartair ELTs have a 9% rate of defects. 8
- If a randomly selected ELT is then tested and is found to be defective, find the probability that it was made by the Altigauge manufacturing company.
 - If a randomly selected ELT is then tested and is found to be no defective, find the probability that it was made by the Bryant manufacturing company.
2. a) A printer ink has a life of X hours. The variable X is modeled by 7

$$\text{probability function } f(x) = \begin{cases} 720x^{-2}, & 400 \leq x \leq 900 \\ 0, & \text{otherwise} \end{cases}$$

Find:

- i. Probability that printer ink has lifetime not more than 550 hours.
 - ii. Probability that printer ink has lifetime more than 700 hours given that it has already printed more than 600 hours.
 - iii. Find expected life time of a printer ink.
- b) Define central limit theorem. Determine how many times a fair coin must be tossed in order that the probability will be at least 0.90 that the proportion of head will lie between 0.4 and 0.6.
3. a) An information source emits a ten digit message into a channel in binary code. Each digit is chosen independently and is one with probability 0.3. Find the probability that the message contains:
 - i. Three ones.
 - ii. Between 2 and 4 ones (Inclusive).
 - iii. No less than 2 zeros.
- b) An office switch board receives an average of 4 emergency calls in a 10 minute interval. What is the probability that (i) there is no call in a 10 minutes interval, (ii) there is at most 2 calls in 5 minutes interval?
- c) Suppose that the life time (in months) of a large number of transistors is a gamma variable with $\alpha=6$ and $\beta=4$. Find the probability that a transistor will last at most 24 months. Also find mean life time of these transistors.
4. a) In a test administered to 1000 students, the average score was 60 and standard deviation 10. Find:
 - i. The number of students exceeding a score 50.
 - ii. The number of students lying between 44 and 74.
 - iii. The value of score exceeded by the top 100 student.
- b) Customers in a certain city are continually switching the brand of soap they buy. If a customer is now using brand A, the probability he will use brand 'A' next week is 0.5, that he switches to brand 'B' is 0.2 and that he switches to brand 'C' is 0.3. If he now uses brand B, the probability he uses B next week is 0.6 and the probability that he switches to C is 0.4. If he now uses brand C, the probability he uses C next week is 0.4, that he switches to A is 0.2 and to B is 0.4. Assume

the process is a Markov Chain.

- i. Find the probability a customer now using brand A will be using brand B in three weeks.
- ii. If the percentage of customers now using brand A is 30%, the percentage using brand B is 20% and the percentage using brand C is 50%, find the percentage of customers using brand C in three weeks.
- iii. Find the percentage of customers using each brand of soap in the long run.

5. a) A city has its water supplied from a dam. Prompted by water scarcity in summer months, an investigation was made of the data on rainfall and the water content of the dam in the beginning of the summer. From the investigation, it was found that if in the beginning of the summer, the dam was full, the probability that it would be full in the next summer is 0.9 and if in the beginning of the summer, the dam was not full, the probability that it would not full in the beginning of the next summer was 0.4. What is the transition probability matrix of this problem? Also, what is the probability that it will full after three years given that in the beginning of that summer the dam was not full. 7
- b) A self service store employs one cashier at its counter. Nine customers arrive on an average in every 5 minutes while the cashier can serve 10 customers in 5 minutes. If the arrival rate follows Poisson distribution and the service rate follows exponential distribution, find: 8
- i. The average number of customers in the queue.
 - ii. Average time spent by a customer in the system.
 - iii. Average time spent by a customer in the queue.
6. a) During 8:00 – 10:00 AM each morning, a train arrives every 20 minutes in a yard. The service times have an average of 36 minutes for each train. If the capacity of the yard is 4 trains only, find: 7
- i. The probability that the yard will be empty.
 - ii. the average queue size.
- b) In a factory, the customers have to pass through three counters. The customers buy coupons at the first counter, select and collect the snacks at the second counter and collect tea at third counter. The server at each counter takes on an average 1.5 minutes although the 8

distribution of service time is approximately Poisson at an average rate of 6 per hour. Find the average time a customer spends waiting in cafeteria. Also find the most probable time spent in getting the service.

7. Write short notes on: (Any two)
- a) Law of large number.
 - b) Moments generating function.
 - c) Recurrent and Transient State.

POKHARA UNIVERSITY

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Semester: Spring

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Full Marks: 100

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Attempt all the questions.

1. a) In a certain group of computer personnel, 65% have insufficient knowledge of hardware, 45% have inadequate idea of software, and 70% are either one or both of the two categories. What is the percentage of people who know software among those who have a sufficient knowledge of hardware? 7
- b) A factory has three machines A, B, and C which produce 40%, 35%, and 25% of the products respectively. Out of their output, 8%, 10%, and 5% are defective respectively. An item is chosen at random from the total output and tested. What is the probability that it is good? If it is good, find the probability that it was manufactured by machine 8
 - i. A
 - ii. B
 - iii. C
2. a) Assume that telephone calls come to a hotel switch-board at an average rate of 12 calls per minute. Determine the probability of receiving, in a 30 second interval, exactly 4 calls, or at least 4 calls, or at most 4 calls. 7
- b) The joint density function of X and Y is given by 8

$$f(x, y) = Kxy, \text{ if } 0 < x < 2, 0 < y < 4 \text{ and } 0 \text{ elsewhere}$$

Find:

 - i. the value of the constant K
 - ii. find $E(X)$, $E(Y)$, $\text{Var}(X)$, $\text{Var}(Y)$
 - iii. Check if X and Y are independent.
3. a) It is known that 5% of the screws manufactured by an automatic machine are defective. If a sample of 20 screws is selected at random, 7

find the probability that the sample contain:

- i. exactly 2 defective screws
- ii. at least 2 defective screws
- iii. at most 2 defective screws
- iv. no defective screws

- b) The heights of boys in a particular age follows a normal distribution with mean 150.3 cm, and standard deviation 5 cm. Find the probability that a boy picked at random from this age group has height
- i. less than 153 cm
 - ii. more than 158 cm
 - iii. between 150 and 158 cm

4. a) A railway reservation center has a single booking counter. During the rush hour, customers arrive at the rate of 30 customers per hour. The average number of customers that can be attended by the booking attendant is 40 per hour. Assuming that the arrivals are Poisson and the service time is exponentially distributed, find:
- i. probability that the operator is idle
 - ii. average number of customers in the system
 - iii. average time that customer spends in the system
 - iv. average number of customers in the queue

- b) A petrol pump station has 4 pumps. The service time follows an exponential distribution with a mean of 6 minutes, and vehicles arrive for service in a Poisson process at the rate of 30 per hour.
- i. what is the probability that an arrival will have to wait in the line?
 - ii. find the average waiting time in the queue, average time spent in the system and the average number of vehicles in the system.
 - iii. for what percentage of time would the pumps be idle on average?

5. a) There are three brands of beauty products A, B, and C in a shop. It has been found that a person when purchases a beauty product of a particular brand, will continue to buy the same brand or switch over to another brand during his next purchase of a beauty product in the shop. The transition probability matrix associated with the three brands is given below:

$$P = \begin{pmatrix} 0.4 & 0.3 & 0.3 \\ 0.6 & 0.1 & 0.3 \\ 0.2 & 0.3 & 0.5 \end{pmatrix}$$

If the initial distribution of purchase of the brands A, B, and C is [0.4 0.4 0.2], determine the distribution of the brands after three purchases.

- b) There are two food stores A and B in a certain area. An investigation of the preferences of customers revealed that with probability 0.15 a customer of store A one week would go over to store B next week and with probability 0.10 that a customer of store B would go over to store A. If initially, 60% of the customers were with store A, and remaining with B, what percentage of customer will remain with A and B, after 4 weeks? 8
6. a) A barber shop has two barbers and three chairs for customers. Assume that the customers arrive in a Poisson fashion at a rate of 5 per hour and each barber serves a customer, the service time being exponentially distributed with a mean of 15 minutes. Find: 7
- i. the probability that the shop is empty
 - ii. expected number of customers in the shop
- b) Determine steady state probabilities of a homogeneous markov chain given by the following transition probability matrix: 8

$$\begin{matrix} 0.1 & 0.6 & 0.3 \end{matrix}$$

$$\begin{matrix} 0.5 & 0.1 & 0.4 \end{matrix}$$

$$\begin{matrix} 0.1 & 0.2 & 0.7 \end{matrix}$$

7. Write short notes on: (Any two) 2×5
- a) Binomial Distribution
 - b) Memoryless property of Exponential distribution
 - c) Stochastic Process

सुमा स्टेसनरी सप्लायर्स एण्ड फोटोकॉमी सर्विस
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POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

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Full Marks: 100

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Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) A binary communication channel carries data as one of two types of signals denoted by 0 and 1. Owing to noise, a transmitted 0 is sometimes received as a 1 and a transmitted 1 is sometimes received as a 0. For a given channel, assume a probability of 0.94 that a transmitted 0 is correctly received as a 0 and a probability of 0.91 that a transmitted 1 is received as a 1. Further assume a probability of 0.45 of transmitting a 0. If a signal is sent, determine: 8
- i. Probability that a 1 is received
 - ii. Probability that a 0 is received
 - iii. Probability that a 1 was transmitted, given that a 1 was received
 - iv. Probability that a 0 was transmitted, given that a 0 was received
- b) The joint probability density function of two random variables X and Y is given by 7
- $$f(x,y) = \frac{9(1+x+y)}{2(1+x)^4(1+y)^4} \text{ for } x \geq 0, y \geq 0$$
- Find the marginal distribution of X and Y, and check the independence.
2. a) The time required to repair a machine is exponentially distributed with parameter $\frac{1}{2}$. What is the probability that a repair time exceeds 2 hour? What is the conditional probability that a repair time takes at least 10 hours given that its duration exceeds 9 hours? 8
- b) The life time in hours of a certain electrical equipment has the normal distribution with mean 80 hours and standard deviation 16 hours 7

- i. What is the probability that equipment lasts at least 100 hours?
- ii. If the equipment has already lasted 88 hours, what is the conditional probability that it will last at least another 12 hours?
3. a) How many times would you have to roll a fair dice in order to be at least 99% sure that the relative frequency of having a six come up is within 0.02 of the theoretical probability 1/6.
- b) A discrete random variable X takes the values -1, 0, 1 with probabilities $1/8, 3/4, 1/8$ respectively. Evaluate $P\{|X-E(X)| \geq 1\}$ and compare it with probability given by Chebyshev's inequality.
4. a) Find the characteristic function of the uniform distribution

$$f(x) = \begin{cases} \frac{1}{b-a} & \text{if } a < x < b \\ 0 & \text{otherwise} \end{cases}$$

Also find mean and variance.

- b) The arrival of large jobs at a computer center forms a Poisson process with rate of 2 per hour. The service times of such jobs are exponentially distributed with mean 20 minutes. Only 4 large jobs can be accommodated in the system at a time. Determine the probability that a large job will be turned away because of lack of storage.
5. a) Traffic to a message switching centre for one of the outgoing communication lines arrive in a random pattern at an average rate of 240 messages per minute. The line has a transmission rate of 800 characters per second. The message length distribution (including control characters) is approximately exponential with an average length of 176 characters. Calculate the following principal statistical measures of system performance, assuming that a very large number of message buffers are provided:
- i. Average number of messages in the system
 - ii. Average number of messages in the queue waiting to be transmitted
 - iii. Average time a message waits for transmission
 - iv. Probability that 10 or more messages are waiting to be transmitted

- b) Patient arrives for a physical examination according to a Poisson

process at the rate of one per hour. The physical examination requires three stages, each one independently and exponentially distributed with a service time of 15 minutes. A patient must go through all three stages before the next patient is admitted to the treatment facility. Determine the average number of delayed patients and average length of queue(L_q) for this system. Also find expected time a patient spend in physical examination centre.

6. a) A message transmission system is found to be Markovian with transition probability of current message to next message as given by

$$P = \begin{pmatrix} 0.2 & 0.3 & 0.5 \\ 0.1 & 0.2 & 0.7 \\ 0.6 & 0.3 & 0.1 \end{pmatrix}$$

The initial probabilities of the states are given by probability vector

$P(0) = (0.4, 0.3, 0.3)$. Find the probabilities of the next two messages.

- b) Assume that a computer system is in one of three states: busy, idle, or undergoing repair, respectively denoted by states 0, 1, and 2. Observing its state at 2 P.M. each day, we believe that the system approximately behaves like a homogeneous Markov Chain with the transition probability matrix.

$$P = \begin{pmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0.0 & 0.4 \end{pmatrix}$$

Prove that the chain is irreducible, and determine the steady state probabilities.

2x5

7. Write short notes on: (Any two)

- a) Bayes Rule
- b) Memoryless property of Exponential Distribution
- c) Central limit theorem

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Probability and Queuing Theory

Semester: Spring

Year : 2016

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) A consulting firm rents cars from three agencies, 20% from agency D, 20% from agency E, and 60% from agency F. If 10% of the cars from D, 12% of the cars from E, and 4% of the cars from F have bad tires, what is the probability that the firm will get a car with bad tires? If a randomly selected tire is found to be a bad tire, what is the probability that it was rented from agency D? 8
- b) Show that for 1,000,000 flips of a balanced coin the probability is at least 0.99 that the proportion of heads will fall between 0.495 and 0.505. 7
2. a) Among the 24 invoices prepared by a billing department, 4 contain errors while the others do not. If we randomly check 2 of these invoices, what is the probability that
 - i. both will contain errors
 - ii. neither will contain error7
- b) If two random variables X and Y have the joint probability density function

$$f(x,y) = \frac{2}{3}(x+2y) \text{ for } 0 < x < 1, 0 < y < 1, 0 \text{ otherwise}$$
8
 - i. Find the marginal density of X and Y.
 - ii. Check the independence of X and Y.
3. a) A random variable has a normal distribution with $\mu = 62.4$. Find its standard deviation if the probability is 0.20 that it will take on a value greater than 79.2. 8
- b) At a checkout counter customers arrive at an average of 1.5 per minute. Find the probabilities that
 - i. at most 4 will arrive in any given minute
 - ii. at least 3 will arrive during an interval of 2 minutes7
4. a) If 2 independent random samples of size $n_1=9$ and $n_2=16$ are taken 7

from a normal population, what is the probability that the variance of the second sample will be at least 2.4 times the variance of the first sample?

- b) What do you mean by memoryless property of Exponential Distribution? Explain with necessary derivation.
5. a) Telephone calls arrive at a booth according to poisson distribution with a mean time of 9 minutes between two consecutive calls. The length of a call is assumed to be exponentially distributed with the mean of 3 minutes. Calculate:
- the probability that a person will have to wait to make a call
 - the average queue length
- b) The arrival of large jobs at a computer center forms a Poisson process with rate 2 per hour. The service time of such jobs are exponentially distributed with mean 20 minutes. Only 4 large jobs can be accommodated in the system at a time.
- Determine the probability that a large job will be turned away because of lack of storage
 - What is the probability that the arriving customer has to wait?
6. a) A supermarket has two girls ringing up sales in the counters. Let the service time for each customer be exponential with mean 4 minutes and people arrive in the queue in Poisson fashion at the rate of 10 an hour.
- What is the probability that all servers are jobless?
 - What is the probability that an arriving customer has to wait?
- b) Consider the cascade of binary communication channel as given by transition probability matrix
- $$P = \begin{matrix} & 3/4 & 1/4 \\ 1/2 & & 1/2 \end{matrix}$$
- Compute the n step transition probability matrix.
7. Write short notes on: (Any two)
- Conditional Probability
 - Stochastic Process
 - Markov Chain

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. NCIT College

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Probability and Queuing Theory

Semester: Spring

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) A group of five printers in a sample consists of three good, labeled g_1 , g_2 and g_3 , and two defective, labeled d_1 and d_2 . If three printers are selected at random from this group, what is the probability of the event E = "Two of the three selected printers are good"? 8

- b) The Joint probability density function of two dimensional random variable (X, Y) is given by 7

$$f(x) = 4xy \quad 0 \leq x \leq 1, 0 \leq y \leq 1 \\ = 0 \quad \text{Otherwise}$$

- i. Find marginal probability density function of X and Y .
- ii. Find conditional probability density of X given $Y=y$.
- iii. Examine whether X and Y are independent.

2. a) A random variable X has the following probability distribution. 8

X	0	1	2	3	4	5
p(x)	a	a/2	a/3	a/4	a/5	a/6

Find the following:

- i. value of a ;
- ii. $p(X < 3)$
- iii. $P(X \geq 3)$
- iv. $p(0 < X < 5)$

- b) The probability that the noise level of a band pass amplifier will exceed 2 db is 0.1. Find the probability that among 100 such amplifiers the noise level of 7

- i. One will exceed 2 dB;
- ii. At most two will exceed 2 dB;
- iii. Two or more will exceed 2 dB.

3. a) A man leaving for work every morning is equally likely to step out of his door at any time between 8:00 to 8:12. If he works for 220 days each year, compute the probability that the average time he leaves for work lies between 8:04 to 8:08. 8

- b) At a rail station, 3 passengers arrive per minute on the average. What is the probability that exactly 30 customers will arrive during a 5 minute span?
4. a) On any given day 4000 cars pass the Birgunj-Raxaul Boarder. The actual number of cars X is Poisson distributed with parameter $\lambda=3000$. Use the normal approximation to find $P(X > 3300)$, $P(X \leq 4400)$ and $P(3600 \leq X \leq 4500)$.
- b) What is Normal distribution? Describe the main features of normal curve. Also briefly explain the significance of normal distribution.
5. a) Assuming that a computer system is in one of the three states: busy, idle or undergoing repairs. Observing its state at 12 PM each day, we believe that the system behaves approximately like a homogenous MC with the tpm given by
- $$\begin{pmatrix} 0.8 & 0.2 & 0.3 \\ 0.1 & 0.6 & 0.2 \\ 0.5 & 0 & 0 \end{pmatrix}$$
- Show that the MC is irreducible.
- b) In a university canteen it was observed that there were only two servers who takes on an average 4 minutes to serve a student. If students arrive in the canteen at an average of 30 per hour, how much time is a student expected to wait for his turn? How many students are expected to be in the queue at any time?
6. a) What is transition probability matrix? Given that transition probability matrix of markov chains as shown below. Obtain the n-step transition probability and then find two-step and three-step transition probabilities.
$$\begin{pmatrix} 1/6 & 5/6 \\ 1/12 & 11/12 \end{pmatrix}$$
- b) At TIA, it takes 8 minutes for a plane to land. Although incoming planes have scheduled arrival times the wide variability in arrival time produces an effect making the incoming planes appear to arrive in Poisson fashion at an average rate of 5 planes an hour. A pilot has to exert to circling around the valley till it gets its turn. Calculate the average time that the plane has to circle around the valley in the air.
7. Write short notes on: (Any two)
- a) Exponential distribution
- b) Additional property of expectation
- c) Pure death process

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2018

Programme: BE

Full Marks: 100

Course: Probability and Queuing Theory

Pass Marks: 45

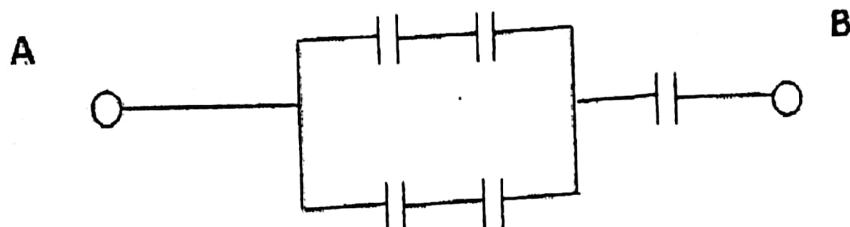
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

-) For the circuit given below, the probability of closing each relay of the circuit is known to be 0.6. Assume that the relays act independently. What is the probability that a current will exist between the terminals A and B. 7



- b) State Bayes' theorem. An aircraft emergency locator transmitter (ELT) is a device designed to transmit a signal in the case of a crash. The Altigauge manufacturing company makes 80% of the ELTs, the Bryant Company makes 15% of them, and the Chartair Company makes the other 5%. The ELTs made by Altigauge have a 4% rate of defects, the Bryant ELTs have a 6% rate of defects, and Chartair ELTs have a 9% rate of defects. 8
- If a randomly selected ELT is then tested and is found to be defective, find the probability that it was made by the Altigauge manufacturing company.
 - If a randomly selected ELT is then tested and is found to be no defective, find the probability that it was made by the Bryant manufacturing company.

- a) A consulting firm rents cars from three agencies, 20% from agency D, 7
 20% from agency E, and 60% from agency F. If 10% of the cars from D, 20% from agency E, and 60% from agency F have bad tires, what 12% of the cars from E, and 4% of the cars from F have bad tires? is the probability that the firm will get a car with bad tires?
- b) It is known that 5% of the screws manufactured by an automatic machine 8
 are defective. If a sample of 20 screws is selected at random, find the probability that the sample contains (a) exactly 2 defectives, (b) at least 2 defective screws, (c) no defective screws
- a) In a test administered to 1000 students, the average score was 60 and 7
 standard deviation 10. Find:
 - The number of students exceeding a score 50.
 - The number of students lying between 44 and 74.
 - The value of score exceeded by the top 100 student.
- b) What do you mean by memoryless property of Exponential Distribution? 8
 Explain with necessary derivation
- a) A random sample of size 100 is taken from an infinite population having 7
 the mean $\mu=76$ and variance $\sigma^2= 256$. What is the probability that sample mean (X) will be between 75 and 78?
- b) A departmental store has two girls ringing up sales in the counters. Let 8
 the service time for each customer be exponential with mean 4 minutes and people arrive in the queue in Poisson fashion at the rate of 10 an hour.
 - What is the probability that all servers are jobless?
 - What is the probability that an arriving customer has to wait?
- a) A telephone exchange has two long distance operators. The telephone 7
 company finds that during the peak load, long distance calls arrive in a Poisson fashion at an average rate of 15 per hour. The length of service on these calls is approximately exponentially distributed with mean length 5 minutes. What is the probability that a subscriber will have to wait for his long-distance call during peak hour of the day?
- b) A self-service store employs one cashier at its counter. Nine customers 8
 arrive on an average in every 5 minutes while the cashier can serve 10 customers in 5 minutes. If the arrival rate follows Poisson distribution and the service rate follows exponential distribution, find:
 - The average number of customers in the queue.
 - Average time spent by a customer in the system.

Average time spent by a customer in the queue.

6. a) During 8:00 – 10:00 AM each morning, a train arrives every 20 minutes in a yard. The service times have an average of 36 minutes for each train. If the capacity of the yard is 4 trains only, find: 7
- The probability that the yard will be empty.
 - The average queue size.
- b) In a factory, the customers have to pass through three counters. The customers buy coupons at the first counter, select and collect the snacks at the second counter and collect tea at third counter. The server at each counter takes on an average 1.5 minutes although the distribution of service time is approximately Poisson at an average rate of 6 per hour. Find the average time a customer spends waiting in cafeteria. Also find the most probable time spent in getting the service. 8
7. Write short notes on: (Any two) 2×5
- Conditional Probability
 - Moments generating function
 - Stochastic Process

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Probability and Queuing Theory

Semester: Fall

Year : 2019

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) The chance that a doctor A will diagnose a disease X correctly is 60%.
 The chances that a patient will die by his treatment after correct diagnosis is 40%, and the chance of death by wring diagnosis is 70%. If a patient of doctor A, who had disease X died. What is the chance that his disease was diagnosed correctly? 7

- b) An information source emits a six-digit message into a channel in binary code '0' or '1'. Each digit is chosen independently of the others and is a '1' with probability 0.3. If a message is sent, what is the probability that it contains:
 i. Exactly three '1's
 ii. '1's beween 2 and 4 (inclusive)
 iii. No less than to '0's 8

2. a) A random variable X has the following probability distribution. 7

X	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

- i. Find a
 ii. Find $P(X < 3)$, $p(X \geq 3)$, $P(0 < X < 5)$.

- b) An information source emits a five digit message into a channel in a binary code. Each digit is chosen independently and is one with probability 0.3. Find the probability that the message contains: 8

- i. Exactly Three ones
 ii. Four ones and one zero
 iii. At least two ones
 iv. None of the ones

3. a) A blindfolded marksman finds that on the average he hits the target 4 times out of 5. If he fires 4 shots, what is the probability of
 i. More than 2 hits?
 ii. Atleast 3 misses?
 b) The time taken by a milkman to deliver milk is normally distributed with mean 12 minutes and standard deviation 2 minutes. He delivers milk every day. Estimate the number of days during the year when he takes
 i. longer than 17 minutes
 ii. less than 10 minutes
 iii. between 9 and 13 minutes
4. a) State the chebyshev's inequalities. Determine how many times an unbiased coin must be tossed in order that the probability will be at least 0.90 that the proportion of head will lie between 0.4 and 0.6.
 b) In a certain city the daily consumption of water (in millions of gallons) follows approximately a gamma distribution with $\alpha=2$ and $\beta=3$. If the daily capacity of this city is 9 million gallons of water, what is the probability that on any given day the water supply is inadequate?
5. a) A message transmission system is found to be Markovian with probability of current message to next message as given by

$$P = \begin{pmatrix} 0.2 & 0.3 & 0.5 \\ 0.1 & 0.2 & 0.7 \\ 0.6 & 0.3 & 0.1 \end{pmatrix}$$

The initial probability of the states are given by probability vector $p(0) = (0.4, 0.3, \text{ and } 0.3)$.

Find the probabilities of the next two messages.

- b) Assume that a compute system is in one of the three states: busy, idle or undergoing repairs. Observing its state at 2 PM each day, we believe that the system behaves approximately like a homogeneous markov chain with tpm given by

$$\begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0 & 0.4 \end{bmatrix}$$

Show that the markov chain is irreducible.

6. a) Students of PU arrives at convocation at the rate of 30 per minutes in a Poisson manner. Gate doesn't contain more than 14 students at a time.

Service time per student is exponential with a mean rate of 20 per hour.
Calculate the various OC for this queuing system.

-) A barber shop has 2 barbers and 3 chairs for customers. Assume that the customers arrive in a Poisson fashion at a rate of 5 per hour and each barber serves a customer, the service times being exponential with a mean of 15 minutes. Furthermore, if a customer arrives and if there are no empty chairs, he will leave. Find 7
- probability that Shop is empty
 - probability that there are K customers in shop
 - Expected number of customers in shop

Write short notes on: (Any two) 2×5

- Stochastic process
- Conditional Probability
- Memory less Property of Exponential Distribution

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2019

Programme: BE

Full Marks: 100

Course: Probability and Queuing Theory

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) In a particular pain clinic, 10% of patients are prescribed narcotic pain killers. Overall, five percent of the clinic's patients are addicted to narcotics (including pain killers and illegal substances). Out of all the people prescribed pain pills, 8% are addicts. If a patient is an addict, what is the probability that they will be prescribed pain pills? 8
1. b) Nine items are taken at random from a box of 21 items. The box is rejected if more than 3 item is found to be faulty. If there are 5 faulty items in the box, find the probability that the box is accepted. 7
2. a) A credit accounts on store can be 0,1,2 months, paid up or bad debt can be given with tpm

$$P = \begin{matrix} 0.2 & 0.5 & 0.1 & 0.2 & 0 \\ & 0.2 & 0.2 & 0.4 & 0.1 & 0.1 \\ & & 0 & 0 & 0 & 1 & 0 \\ & & 0 & 0 & 0 & 0 & 1 \end{matrix}$$
8
2. b) Find the total time the account will be kept alive. 7
3. a) Let X and Y have the joint probability mass function

$$f(x, y) = (x + y)/21, x = 1, 2, 3 \text{ and } y = 1, 2.$$
 - Find marginal probability of X and Y. 7
 - Find conditional probability distribution of X given Y= y. 8
 - Are X and Y independent? 8
3. b) A life insurance salesman sells on the average 3 life insurance policies per week. Use Poisson's law to calculate the probability that in a given week he will sell
 - Some policies 7
 - 2 or more policies but less than 5 policies. 7
 - Assuming that there are 5 working days per week, what is the probability that in a given day he will sell one policy? 7
- b) The time taken by a delivery man to deliver milk is normally 7

distributed with mean 12 minutes and standard deviation 2 minutes. He delivers milk every day. Estimate the number of days in a year (take 1 year = 365 days) when he takes

- i. Longer than 17 minutes ii. between 9 and 13 minutes

4. a) A population of 29 year-old males has a mean salary of \$29,321 with a standard deviation of \$2,120. If a sample of 100 men is taken, what is the probability their mean salaries will be less than \$29,000?
- b) Consider a markov chain with 3 states, $S=\{1,2,3\}$ that has following tpm as :

$$\frac{1}{4} \quad \frac{1}{2} \quad \frac{1}{2}$$

$$1/3 \quad 0 \quad 2/3$$

$$\frac{1}{2} \quad \frac{1}{2} \quad 0$$

- If we know $P(X_1=1)=P(X_1=2)=1/4$, find $P(X_1=3, X_2=2, X_3=1)$
5. a) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (time taken to hump to train) distribution is also exponential with an avg. of 36 minutes. Calculate

- i. Expected queue size (line length)
- ii. Prob. that the queue size exceeds 10.

- b) A super market has a single cashier. During the peak hours, customers arrive at a rate of 20 customers per hour. The average no of customers that can be processed by the cashier is 24 per hour. Find:

- i. The probability that the cashier is idle.
- ii. The average no of customers in the queue system
- iii. The average time a customer spends in the system.
- iv. The average time a customer spends in queue.
- v. The any time a customer spends in the queue waiting for service

6. a) Trains arrive at the yard every 15 minutes and the services time is 33 minutes. If the line capacity of the yard is limited to 5 trains, find the probability that yard is empty and the average no of trains in the system.

- b) What is Kendall Expression? Describe each terms used in it. Write the OC of M/M/s:M/G/D model.

7. Write short notes on: (Any two)

- a) Baye's Rule
- b) Beta Distribution
- c) Types of Random Variables

2x5

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester - Fall

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How java is more secure than other programming language? Explain. 5
b) Write a java program to generate the following triangle using for loop. 5
- 1
0 1
1 0 1
0 1 0 1
- c) Explain the uses of super and this keyword with suitable example. 5
2. a) What are the significant uses of interface? Explain how it is implemented in java. 8
b) Write a function that takes an array of integers as an argument and returns sum of even numbers in that array. 7
3. a) Explain the user defined Exceptions with suitable java code. 8
b) What is user define package? Illustrate the process of defining and using define package with suitable example. 7
4. a) What is an Applet? Write an applet program to play an audio file. The name of audio file is supplied from HTML tag. 8
b) What is an event? Briefly explain the models available for event handling. 7
5. a) Write down the significant uses of URL and URL Connection classes. 7
b) What is the difference between TCP/IP Programming & datagram Programming? Briefly explain the Classes and Methods that are used to create a TCP/IP Server application. 8
6. a) What are the steps involved for making a connection with a database. 8
Write a Java program to extract and display the information in console from ABC table of Ms-access with suitable values. The ABC table has AAA and BBB fields.

1

(62)

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NCIT College

b) Define JDBC and ODBC. Briefly explain the different types of JDBC 7
driver.

7. Write short notes on **any two**:
- a) Dynamic Dispatching
 - b) Layout Management
 - c) *Graphics object*

2x5

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester: Spring

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the features of Java Programming. Why Java is popular than C/C++. 8
- b) What do you mean by interface? How do you implement interface in java. Explain with example program. 7
2. a) Explain the following terms with suitable program. 8
i. Access Protection Mechanism
ii. Inner classes:
- b) Explain various stream classes available in Java. Write a program using any stream class for writing text to a file. 7
3. a) What does security restriction means in applet? List out the attributes of applet tag and explain them. 8
b) Write a program to create a frame in swing. The frame should contain three text fields with labels arg1, arg2 and result respectively. a menu called file with sub menus add, subtract and close. 7
4. a) Explain the Layout Manager in detail. Write a program to change the font of text in textfield of the Frame. The frame contains 3 checkboxes named bold, italic and plain. 8
b) Write a simple GUI addition application that used two input dialogs to obtain integers from the user and a message dialog to display the sum. 7
5. a) What is socket? Write a program to find local IP Address & Hostname of the system. 8
b) Explain URL and URL connection class with suitable program. 7
6. a) Write a program to connect to a database using JDBC. Assume that database name is test Db and it has table named employee with 2 records. 8

- b) Explain different types of JDBC drives.
7. Write short notes on: (Any two)
- a) Casting abstract class
 - b) Life Cycle of Applet
 - c) Frame Layout.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester: Fall

Year : 2014

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain how java is platform independent. Write a java program to print "Hello Nepal" in console. 7
- b) What is inheritance? Explain it with suitable example. 8
2. a) Write a java program to demonstrate runtime polymorphism via method overriding. Write the following classes: Animal as a base class, Cat (derived class of Animal) and Cow (derived class of Animal) .Write a method eat () in Animal class and override that method in the derived classes. 8
- b) What are exceptions? Write a program to input an integer from keyboard and print it on the console. Fire an exception if the input is other than integer using try and catch blocks. 7
3. a) Write down the steps for converting java application to java applet. 5
- b) Write an applet program with three text fields with the following names: "number1", 'number2" and "result". When the user clicks a "sum" button then the sum of the two number in "number1" and "number2" should be displayed in the text field named "result". 5
- c) What do you mean by Border Layout? Give an example program. 5
4. a) Write a following program using Frame. 8
- i. It should have three Text Field and one Button
 - ii. It should accept 2 numbers
 - iii. When user clicks the button, it should calculate the sub of two number entered in two Text Field and display the result in third Text Field.
- b) Write a program to display "Pokhara University" inside an ellipse. 7
- Note that the string should be in serif font with size 20 and style bold.

5. a) Define Socket programming and its usage in java.
b) What do you mean by URL? Provide a simple program using the URL class to show URL processing in java. 7 8
6. a) What do you mean by JDBC Drivers? Write short notes about :
i. JDBC-ODBC Bridge
ii. Java Native Driver 8
- b) Write the steps to insert data in following table 7
- Table name : student
- | <u>Column</u> | <u>Data Type</u> |
|---------------|------------------|
| Id | number |
| Name | varchar |
| Roll | number |
7. Write short notes on: (Any two) 2x5
- a) Reflection
b) Data Types
c) Closable Frames.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Programming In Java

Semester: Spring

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) What do you mean by Java System Overview? Explain why Java program are known as portable and architecture neutral. 7
- b) Differentiate between package and interface in Java. Provide examples for each of them. 8
- a) Implement an abstract class named Person and two subclasses named Student and Employee in Java. A person has a name, address, phone number and e-mail address. A student has a class status (freshman, sophomore, junior or senior). Define the status as a constant. An employee has an office, salary and date-hired. Implement the above classes in Java. Provide Constructors for classes to initialize private variables. Override the to String method in each class to display the class name and the person's name. Write an application to create objects of type Student and Employee and print the person's name and the class name of the objects. 8
- b) Why do we need to serialize an object? Write a program to read numbers from the console using the Input Stream. Also, apply the method of object serialization in your program. 7
- a) How can a HTML file pass data to an applet? Explain with relevant code tags. 5
- b) Write an applet program with three textfields with the following names:
"number1", "number2" and "result". When the user clicks a "sum" button then the sum of the two numbers in "number1" and "number2" should be displayed in the text field named "result". 5
- c) Differentiate between Gridbag Layout and Grid Layout. 5

4. a) What are heavyweight components in Java? Are there any alternatives to those heavyweight components? Provide a comparative illustration.
- b) Write a program to draw a Bar Char of Number of Students giving exam for Java, C and C++.
5. a) Differentiate between URL and URL Connection class with relevant examples.
- b) Discuss the process of creation of server and client sockets with Exceptions handled explicitly with a suitable example.
6. a) What do you mean by JDBC Drivers? Write short notes about:
- i. JDBC-ODBC Bridge.
 - ii. Java native Driver.
- b) Write a simple Java Program to connect ms access database and insert data in the table named "Student" which have four fields named " id", "name", "address", "DOB", and "Class".
7. Write short notes on: (Any two)
- a) Dialog Box.
 - b) Closable Frames.
 - c) Inner Class.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Programming in Java

Semester: Spring

Year : 2015

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

1. a) Is JVM is machine independent? Explain the use of JVM. How JVM makes Java machine independent. 8
- b) Why is multiple inheritance not supported in Java. Provide a simple code example to support your answer. 7
2. a) What is reflection? Why do we need reflection? Explain with sample code 7
- b) How can you create your own exception in Java? Explain with program. 8
3. a) Discuss about the Sandbox Security model with regard to Java Applet. 5
- b) Explain how to display a picture in an applet. 5
4. a) Differentiate between GridBag Layout and Grid Layout. 5
- b) What is the difference between AWT and Swing package in Java? Write a sample code for creating a closable frame in the front and centre of your desktop. 8
- c) Write a program to draw a Bar Char of the total number of students appearing exam in Java. Also, provide Bar Chart for number of male and female students. 7
- Hint: Each Bar can be drawn using drawRect() and fillRect() method.
5. a) What is an URL. Write a Java program for reading contents in a given URL. 7
- b) Write a client program which connects with server running at port 5000 and send "I am client" message to server and also print received message from server in console. (Assume TCP/IP communication) 8
6. a) Differentiate between simple statements and prepared statements. Provide an example to illustrate their differences. 8
- b) Write a simple Java Program to connect database and read data in the table named "Student" which have four fields named "id", "name", "address", "DOB", and "Class". Assuming the "id" field as simple number, display the data of the students with id less than 100. 7
7. Write short notes on: (Any two) 2×5
 - a) JIT compile
 - b) Repaint method
 - c) Inner Class

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester: Fall

Year : 2016

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How does Java support re-usability? Provide examples. 7
b) Discuss about the concept of instance variable hiding in Java. Illustrate with a code example. 8
2. a) Make a class Human with a name and age. Make a class Employee inherit from Human. Add instance variable salary of type double. Supply a method showData() that prints the Employee's name, age, and salary. Make a class Manager inherit from Employee. Supply appropriate showData() methods for all classes. Provide a test program that tests these classes and methods.
b) Why is exception handling essential? Differentiate between checked and unchecked exceptions with relevant examples. 2+5
3. a) Discuss about the life cycle of an Applet. 5
b) Write an Applet program to illustrate the message sharing between HTML and Applets. 5
c) Differentiate between Panel and Frame. 5
4. a) Write a program to generate a Frame with two buttons "BLACK" and "BLUE". When a button is clicked it should change the background color of the Frame to respective color. 8
b) Write a Java Program to draw a 2D rectangle in green color. Next draw the flag of Nepal inside the rectangle. Write a string "MY NEPAL" below the rectangle. 7
5. a) What is a socket? Differentiate between datagram and stream communication. 7
b) Write the steps to create a client server program. Provide code snippet to for each steps. 8

6. a) What is a ResultSetMetadata. Provide a simple example code to illustrate its usage.
- b) Discuss about the different types of database drivers
7. Write short notes on: (Any two)
- a) Assignment vs. initialization
- b) Closable JFrame
- c) Runtime Polymorphism in Java

सुआम स्टेसनरी सप्लायर्स एण्ड फोटोकॉमी सर्भिस
बालकुमारी, ललितपुर ९८४९५९९५९२
NCIT College

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Programming in Java

Semester: Spring

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Define java. Write a program to print "Hello Java" in a console. 8
b) Define Polymorphism. How should we implement polymorphism in java? Explain with Example. 7
2. a) What is interface? Define with Example. 8
b) Create a class MyClass in a package MyPack. Import newly created class MyClass from I_mClass. 7
3. a) What is the usage of exception handling? Define with example. 8
b) Create a program to write "Hello World" in a file abc.txt. 7
4. a) Define Applet life cycle. 8
b) What is Frame? Create a frame with following attributes:
 Height = 400
 Width = 400
 Title = My Frame 7
5. a) Create a Frame with one button and one textfield, when user clicks on the button the text entered on textfield should be changed to uppercase. 8
b) Explain Event Handling with various types of event available on java. 7
6. a) Define Socket Programming with example. 8
b) Why JDBC is required in java. Explain the role of JDBC Driver. 7
7. Write short notes on: (Any two) 2×5
 - a) Inheritance
 - b) URL
 - c) Java Virtual Machine
 - d) ResultSet

सुन्न स्टेसनरी सलायर्स एड कॉलेजको संग्रही
बालबुद्धी, समिति ४५५, ४९५९८९२
NCIT College

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester: Fall

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Justify the statement, "Java is designed for distributed application". Explain the different types of Java variables. 7
- b) Explain with example: static block, static variable and static method. Why main method is always static and public in Java? 8
2. a) How can you achieve multiple inheritance in java? Explain with a suitable program. 7
- b) What are the main uses of super, finalize and this keyword? Explain how a package is created and accessed while developing an application in Java. 8
3. a) Write a program to store object of a class Student into a file "student.dat" also read the objects from same file and display the state of objects on the screen. Handle possible exceptions. 7
- b) Differentiate error with exception. Write a program to create your own exception class in java. 8
4. a) Explain Applet Architecture. How can you convert applet to application? Explain with suitable example. 7
- b) How Event is handled in Java? Write a Java program to create a swing application with 3 buttons representing your favourite colors. When a button is clicked, the background color must change to the corresponding color. 8
5. a) Differentiate between GridLayout and GridBagLayout. Write a program to show the use of BorderLayout. 7
- b) What is GUI programming? Write a program to draw Nepali flag using graphics. 8
6. a) What is Java URL processing? Demonstrate URLConnection class 7

- method with suitable example program.
- b) What are the different types of JDBC statements available? Explain with example.
7. Write short notes on: (Any two)
- a) Socket Programming in Java
 - b) JDBC Driver types
 - c) Reflection in Java

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Programme: BE

Course: Programming in Java

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Java as Platform Independent Programming Language. 7
b) What is constructor, Explain with example? 8
2. a) Write a program to show the usages of various data types in java. 7
b) Define Inheritance. Write a program which has two classes A and B, where A should act as Parent class and B should inherit from A. 8
3. a) Define Exception handling with Example. 7
b) Create a Frame which has three textfield and one button. When user clicks on button it should calculate sum of the value of first and second textfield and display on third textfield. 8
4. a) What is difference between Interface and Class? Explain with an example. 7
b) Write a program to read content from file "abc.txt" and store it in "xyz.txt". 8
5. a) What are applets? Define Applet life cycle with Example. 7
b) Write a program to send "Message from Pokhara University" from client to server using java socket programming. 8
6. a) Define JDBC. Write a program to update data on following table. 7

Table: student

Column:

NAME	TYPE
id	number
name	varchar
age	number

 b) What is the difference between Frame and Swing? 8
7. Write short notes on: (Any two)
 - a) JRE
 - b) Event handling
 - c) Result Set

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Programming in Java

Semester: Fall

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How is interface different from abstract class? Explain the use of interface to achieve multiple inheritances. 8
- b) What are the uses of abstract keyword? Explain with a suitable program. 7
2. a) Create a class Employee with id, name, post and salary. Create a parameterized constructor to initialize the instance variables. Override the to String() method to display the employee details. 7
- b) What is exception handling? Explain. Write a program to handle Arithmetic Exception. 8
3. a) What is a dialog box? Explain its types. Write a program to create your own dialog box. 8
- b) What are the different types of streams supported by java? Explain. A data file "emp.txt" contains name, address and salary of 30 employees. Write a program to display only those records who are from "Kathmandu". 7
4. a) Create a swing GUI that contains a two buttons (add and subtract) and three text fields. When the buttons are clicked sum or difference of values of first two text fields should be displayed in the third text field respectively. 8
- b) Explain the use of URL and URL Connection class with a suitable program. 8
5. a) Write a program to display all records from the database table. Assume the name of database and table yourself. 8
- b) Differentiate between TCP and UDP. Create a TCP client application that takes input from user and sends it to the server. 8
6. a) How is applet different from normal java program? List out the steps for 8

- converting applet into application.
- b) How can you create closable frames in swing and AWT? Write a program to draw a bar chart. 8
7. Write short notes on: (Any two) 2x5
- a) Reflection API
 - b) History of Java
 - c) JDBC API

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Programming in Java

Semester: Spring

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- What do you mean by architectural-neutral? What are wrapper classes? 7
Explain.
- Mention the scope of all modifiers (private, default, protected and public). Write suitable program to illustrate the concept. 8
- a) What is method overloading? Can you override a private or static method in Java? Explain with an example. 8
- b) How does interface differ from abstract classes? Elaborate using code snippets to justify. 7
- a) Explain about FileReader and BufferedWriter class. How do you create own exception subclasses? Explain with an example. 8
- b) What are the differences between applet and normal java program? Create an applet with the functionalities to play, stop and repeat the audio. 7
- a) Create a swing GUI that contains a text field and a button. When the button is pressed the content in the text field should be changed into uppercase and background color of text field should be changed. 7
- b) Demonstrate various drawing methods. How do you create, load and display image? 8
- a) Differentiate between TCP and UDP sockets. Explain InetAddress class. 7
- b) What are some key classes defined in java to work with datagrams? How do you get a list of IP addresses that are assigned to a network interface? 8
- a) What is the benefit of using Prepared Statement in java? What is JDBC database connection pool? How to setup in Java? 8

- b) A database "testdb" contains a table "employee" with some records having id, name, post, salary. Write a program to update the salary to 50000 whose post is "Manager".
7. Write short notes on (Any Two):
- a) Inner Class
 - b) C++ Vs Java
 - c) Types of JDBC drivers

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Programming in Java

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- i) What are the most powerful features of java? Describe how it is a platform neutral language by a diagram. 7
- ii) Explain multiple inheritance. How is it possible to achieve multiple inheritance in java? 8
- a) What is interface? WAP to show interface implementation in java. 8
- b) Create a program to write "Test on File Handling" inside a file "abc.txt". 7
- a) What is an Applet? Explain life cycle of applet. 8
- b) What are the differences between GridLayout and GridBagLayout? Explain FlowLayout. 7
- i) a) Create a swing GUI that contains a button, and two text fields. When the button is clicked the value of first text field should be checked and display "odd number" or "even number" in the second text field. 8
- b) Create a graphics application to display "Pokhara University" in blue color with font name: Times New Roman, type:Bold and size:20. Also write HTML to embed the applet. 7
- ii) a) Draw a diagram illustrating how client server interaction occurs in UNIX based system, with detailed methods in each step. 7
- b) Create a TCP client/server program in which client sends an integer to the server and the server responds to client by sending square of the number sent by client. 8
6. a) Briefly describe the JDBC-ODBC types of bridge and driver in java. 7

- b) Write a program to display only those records whose salary is more than 25000 from a table that contains id, name, post and salary of some employees.
7. Write short notes on: (Any two)
- a) Reflection API
 - b) Events and event classes
 - c) Types of JDBC drivers

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Programming in Java

Semester: Spring

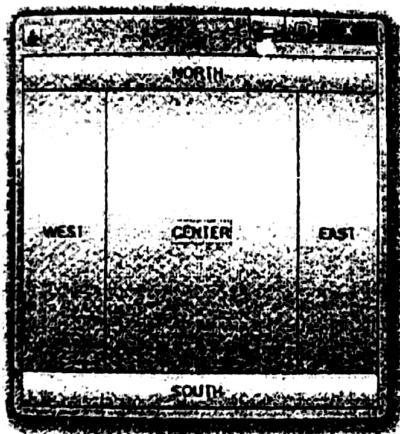
Year : 2019
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- | | | |
|----|---|---|
| a) | List the advantages of java programming language. Why is it also known as platform independent language? | 8 |
| b) | In what condition is the use of "this" operator mandatory? Explain with suitable program. | 7 |
| a) | Why Reflection is regarded as a powerful aspect in java? WAP to demonstrate your answer. | 8 |
| b) | What do you mean by exception? How exception handling is different from error handing? Explain. | 7 |
| a) | State the life cycle of an applet. Can it be changed into application? If yes, justify your answer. | 8 |
| b) | What is layout manager? State the different types of layout manager in swing. WAP to generate the following output in java using Boxlayout. | 7 |



- | | | |
|----|--|---|
| a) | Create a swing GUI which contains a text field (to input radius of circle), a label and a button. When the button is clicked area of circle should be calculated and displayed in the label. | 8 |
| b) | WAP to display the flag of nepal, drawing a graph along with the reasonable coordinates. | 7 |

5. a) Explain network programming. Compare TCP and UDP sockets.
b) Create a TCP client/server program in which client and server communicate by sending a message to each other.
6. a) Draw JDBC architecture and describe different types of JDBC Drivers.
b) Discuss the tags used in applet.
7. Write short notes on: (Any two)
a) Interface and Inner Classes
b) Different event handling mechanisms
c) Executing SQL queries from Java

POKHARA UNIVERSITY

Level: Bachelor
Programme: B.E
Course: Microprocessor and Assembly Language
Programming

Semester - Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

Differentiate microprocessor and microcontroller. Explain the chronological development of Intel microprocessor. 7

Draw the Functional block diagram of 8085 microprocessor and explain 8

Write an assembly language program of 8086 to read a string , count the vowels and display them in clear screen with reverse attribute 8

Explain assembler. Describe one-pass assembler and two - pass assembler with suitable diagrams. 7

Write a program to input string from keyboard and display it. 7

Define linking and relocation. Write an ALP to copy the contents of "TABLE 1" which contains 10 numbers into "TABLE 2" in reverse order. 8

Differentiate between memory mapped and I/O mapped input output. Draw a circuit diagram of an interfacing circuit that contains 4 KB RAM and 4 KB ROM assuming base address of RAM is 8000H. 8

i) What is IVT in 8086? Explain the table in detail with diagram. 7
What is the difference between IDT and IVT?

ii) Why 8255 PPI is used in IO interface? Explain 8255 PPI with block diagram. 8

b) What are the priority modes of 8259 PIC. Explain 8259 interrupt operation with block diagram. 7

6. a) Write a program for 8086 assembler to reverse the string read from keyboard.
b) Draw a I/O write cycle timing diagram for minimum mode.
7. Write short notes on any two:
a) Addressing Modes of 8085
b) DMA
c) Memory

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Microprocessor and Assembly Language
 Programming

Semester: Spring

Year : 2013
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
 Attempt all the questions.*

- Draw the internal architecture of 8 bit microprocessor and explain it. 8
- a) Compare Microprocessor, Microcomputer and Microcontroller. 7
- b) Which is better for high speed operation? Give reason. 7
- c) Draw the timing diagram for the 8085 instruction STA 2013H. 8
- d) Write a program for 8086 assembler to find the sum of even numbers from given array? 7
- e) Explain assembler. Describe one-pass assembler and two-pass assembler with suitable diagrams. 7
- f) Write an 80x86 programs to input string from the keyboard and display the characters on the monitor. 8
- g) What do you mean by address decoding? Design an address decoding circuit to interface $2K \times 8$ RAM, $2K \times 8$ ROM and $8K \times 8$ RAM with starting address 0000h. 7
- h) What do u mean by IVT? Explain various interrupts of 8086 IVT. 8
- i) How interrupt processing occurs in a microprocessor? Explain vector chain and polled interrupt. 8
- j) Why 8251 USART is used in IO interface? Explain its use with block diagram. 7
- k) What is DMA controller? How can we accommodate 16 interrupt sources with 8259 PIC? 8
- l) Describe its internal architecture of 8254 PIT. 7
- Write short notes on: (Any two) 2×5
- a) 8086 flag register
- b) Synchronous and Asynchronous bus
- c) Memory Hierarchy.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Microprocessor and Assembly Language
Programming

Semester: Fall

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) What is microcontroller? Differentiate between Intel 4004 and Intel 8008 microprocessor. 7
- b) Draw the timing diagram of 8085 instruction MVI A,12H. 8
- a) Write an ALP in Intel 8085 microprocessor to find largest and smallest of 10 bytes stored in memory location starting from ~~C001H~~ and store the largest number in port 80H and the smallest number in port 81H. 8
- b) Write an assembly language program for 8086 to accept the number from user through keyboard, calculate its factorial and prints on screen. 7
- a) Describe modular programming and its advantages. Write an ALP to count the positive and negative numbers stored in "Table 1" which contains 10 numbers starting from C050 H. 7
- b) What are the directives in assembly language programming? Explain the role of Macros. 8
- a) Differentiate maskable and non-maskable interrupt with examples. 8
Describe the interrupts of 8086 microprocessor with IVT.
- b) Draw the block diagram of 8254 PIT. Write instructions to generate 5 kHz square waveform. 7
- a) Explain the USART? Write different modes of 8255 PPI. 7
- b) Describe the execution of DMA in both slave mode and master mode with interfacing circuit of 8237 A DMA with 8085 microprocessor. 8
- a) What is memory interfacing? Draw an address decoding circuit to interface input device with 8 input switches at 41 H and LED output at 42H. 8

- b) Explain 8259A PIC with suitable block diagram.
7. Write short notes on: (Any two)
- a) RAM vs. ROM
 - b) Software interrupts
 - c) Polled Interrupt.

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Microprocessors and Assembly Language Programming

Semester: Spring

Year : 2014
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7

Draw block diagram 8086 Microprocessor and explain its Bus Interface. 8

Draw a timing diagram of ADI 45H. 8

Describe various addressing modes provided in 8085 microprocessor. 7

The following 8085 instruction has been written to transfer the content of memory location 2014H to 2015H. Find out error in the instructions, give reason for the error and correct it. What will be the content of memory location 2015 after correction? 7

MVI B, 23H

LXI H, 2014H

MOV M, B

LDA 20H

LXI D, 2015H

STAX D

HLT

सुनाम स्कॉलरशिप एवं प्रोफेशनल कॉर्स
बालकुमारी, लखितपुर ९८४३५११५९२
NCIT College

b) Write a 8086 program in MASM to find the square of a given number. 8

a) Write an assembly language program to input a string from keyboard and print it in reverse order. 7

b) What do you mean by address decoding? Design an address decoding circuit to interface 4K×8 RAM, 8K×8 ROM and 16K×8 RAM with starting address 8000h. 8

a) Explain how 8086 handles interrupt. 7

b) What do you mean by Interrupt Vector Table (IVT)? Explain 7

- predefined interrupts of 8086 microprocessor.
6. a) Write a control word format of 8255 PPI in I/O mode.
b) What is Programmable Interval Timer? Illustrate with a diagram.
7. Write short notes on: (Any two)
- a) Synchronous and Asynchronous bus.
 - b) Macro Assembler.
 - c) DMA controller.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Microprocessor and Assembly Language
Programming

Semester: Fall

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7
- b) Draw block diagram 8086 Microprocessor and explain its Bus Interface Unit. 8
- a) What do you mean by addressing modes? Explain 8086 addressing modes in detail. 7
- b) Define flags and addressing modes. Explain the role of all the flag bits in 8085 microprocessor with essential examples. 8
- a) What do you mean by assembler directives? Explain various assembler directives. 7
- b) What do you mean by Instruction Cycle? Draw the timing diagram of Memory Read operation? Explain. 8
- a) Write a 8086 assembly language program to transfer 16 bytes of data starting from memory locations D000H to E000H. 5
- b) Write an assembly language program to input a string from keyboard and print it in uppercase. 5
- c) What are procedures and macros? Which is better for the development of assembly language programming? 5
- a) What do you mean by Interrupt Vector Table (IVT)? Explain the software interrupts of 8086 microprocessor. 8
- b) What do you mean by address decoding? Design an address decoding circuit to interface 8K×8 ROM and 16K×8 RAM with starting address 8000h. 7
- a) Draw the block diagram of 8255 PPI and explain it in brief. 8
- b) How can we accommodate 16 interrupt sources with 8259 PIC? 7

7. Write short notes on: (Any two)
- a) DMA controller
 - b) Macro Assembler
 - c) Vector and Polling Interrupts

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Semester: Spring

Course: Microprocessor and Assembly Language
Programming

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7
- b) Draw the functional block diagram of 8085 microprocessor. What are the purposes of ALU and flags? 8
2. a) Draw the timing diagram for the 8085 instruction OUT 34H. If the clock frequency of 2MHz is used, then how much time will it take to execute this instruction? 5
- b) The following 8085 instruction has been written to add the content of memory location 2014H with 2015H. Find out error in the instructions, give reason for the error and correct it. What will be the content of memory location 2015 after correction? 5

MVI A, 32H
STA 2014H
MVI A, 23H
STA 2015H
LXI H, 2014H
MOV B, M
LDA 20H
ADD B
LXI D, 2015H
STAX D
HLT

- c) What will be the value of accumulator A after the execution of following 8085 instructions? Justify your result. 5

MVI A, 0
MVI B, 4

MVI C, 5
LOOP: ADD B
DCR C
JNZ LOOP
HLT

3. a) Draw an interfacing circuit to interface 4 KB ROM and 2 KB RAM for 8085 microprocessor.
b) What are IVT and ISR? How is it used to handle software and hardware interrupts? Explain.
4. a) Describe the different modes of 8255 PPI with diagram.
b) Write down the instructions to generate 3 KHz square waveform for 8254 PIT.
5. a) How can we accommodate 16 interrupt sources with 8259 PIC?
b) Write a 8086 program to find the square of a given number.
6. a) Define interrupts. Explain vector chain and polled interrupt.
b) Assuming: DS=2000H, BP=2030H and SI=2020H; State the addressing mode of the following 8086 instructions and find the physical address of the source location.
i. MOV BX, [1234H]
ii. MOV BX, [BP]
iii. MOV BX, [BP+SI]
iv. MOV BX, [BP+SI+5]
v. MOV BX, [SI+4]
7. Write short notes on: (Any two)
a) Synchronous and Asynchronous Data Transfer
b) Maskable and Nonmaskable Interrupts
c) Macro Assembler.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Semester: Fall

Course: Microprocessor and Assembly Language
Programming

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Differentiate between microprocessor, microcontroller and microcomputer. 7
- b) Describe the flags available in 8085 microprocessor. Write an ALP to find the smallest number in a data array. Data are stored in location C000H to C005 H. 8
2. a) Draw the timing diagram of MVIA, 32 H. Also calculate the total time for execution if frequency is 2.5MHz. 7
- b) Write a program in 8086 microprocessor in MASM to find the square root of a given number. Given that the number is a perfect square of two digits. 8
3. a) Differentiate macros and procedures. Write an assembly language program to copy the string from one location in memory to other location. 8
- b) Write a program to display string "POKHARA" into a standard output device using DOS/BIOS interrupt. 7
4. a) Define bus structure. Draw an address decoding circuit to interface 2 KB ROM and 4KB RAM for 8085 microprocessor. 8
- b) How are non vectored interrupts processed? Describe with the necessary hardware implementation. 7

OR

What are interrupts and interrupt vector? What could be the different sources of interrupts? Describe in brief.

5. a) Differentiate: 8
 - i. Data, Control and Address Bus
 - ii. Vectored and Non Vectored Interrupts

- b) Describe the process to transmit and receive the serial data in 8251A USART.
6. a) Describe the Input-output control word and BSR control word in 8255 PPI.
- b) What is DMA? Describe how it works with suitable illustration.
7. Write short notes on: (Any two)
- a) Types of Directives
 - b) Application of PIT
 - c) Evolution of Microprocessor

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Semester: Spring

Year : 2016

Course: Microprocessor and Assembly Language
Programming

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Compare microprocessor, microcomputer and microcontroller. What are the applications of microprocessor? 4+3
- b) Draw and explain the internal architecture of microprocessor. 8
2. a) What do you mean by addressing mode? Explain different addressing modes of 8086 microprocessor with example. 2+5
- b) Draw and explain the timing diagram for STA 8050H instruction. 8
3. a) What do you mean by assembly language programming? Explain the assembling process. What are one pass and two pass assemblers? 2+4+2
- b) Write a program for 8085 to transfer numbers from a table of ten eight bit numbers to another table if bit D₅ is 1 and bit D₅ is 0 else store 0 in the destination table. 7
4. a) Write an assembly language program for 8086 microprocessor to read a number from the user, find the sum of squares of the numbers from 1 up to the entered number and display the result. 7
- b) What do you mean by address decoding? Design an address decoding circuit to interface one RAM chip of 8KB and one ROM chip of 8KB for 8085 microprocessor consecutively at the address C000H. 8
- a) Why is interrupt required in microprocessor system? Explain how interrupt pins of 8085 microprocessors are used. 2+5
- b) What is interrupt vector table? Explain how hardware interrupts are handled in 8086 microprocessor. 3+5
- a) What are the parallel and serial interfaces? Explain RS232 standard. 2+5
- b) What are the modes of parallel data transfer? Draw the diagram of 8255 PPI and explain its operation. 3+5

Write short notes on: (Any two)

- a) Stack operation 2×5
- b) PIC
- c) DMA

सुम स्टेसनरी सप्लायर्स एण्ड फोटोकपी सर्विस
बालकुमारी, ललितपुर ९८४३५१४५१२
• NCIT College

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Microprocessor and Assembly Language
Programming

Semester: Fall

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

- a) How was microprocessor evolved? State the difference between microprocessor and microcontroller and what are its uses in daily life. 7
- b) What are the different addressing modes in 8085? Explain in detail with an example. 8
- a) Write an assembly language program to find factorial of numbers from 1 to 20. 7
- b) Write an assembly language program to print "Gandaki College of Engineering and Sciences" and display it into a standard output device. 8
- a) What are the different modes of operation of an 8086 microprocessor? Draw its internal architecture and explain each block in brief. 8
- b) Differentiate between procedure and macro. List different assembly language development tools. 7
- a) Draw the timing diagram for moving an immediate data to 8086. (Eg: MVI A, 45H). 7
- b) What is the importance of memory interfacing? Draw a circuit diagram of an interfacing circuit for RAM of size 2KB starting at 5300H and ROM of size 4KB starting at 5400H. 8
- a) Draw the block diagram of USART and explain each of them. What are the different control words used in USART? 7
- b) Draw an internal structure of 8255 PPI. Also explain its modes in brief. 8
- a) What is an interrupt and what are its types? Describe an interrupt vector table in 8086. 7
- b) What are different flags in 8086 and how to calculate its physical address? 2x5
- Write short notes on: (Any two)
- a) IVT and ISR
- b) Programmable Interval Timer
- c) Synchronous and Asynchronous Bus

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Semester: Spring

Year : 2017

Course: Microprocessor and Assembly Language
Programming

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) You are required to buy a brand new personal computer. What would you want the specifications and features of the microprocessor in the system and why? Explain with reference to the evolution of microprocessors. 7
- b) Draw block diagram 8086 Microprocessor and explain its Execution Unit. 8
2. a) Write the function, addressing modes, size and name of machine cycles for the following instructions: 6
 - i. MOV A,B
 - ii. MVI A, 32H
 - iii. LXI H, 2030H
- b) Define Instruction cycle, Machine cycle and T-states. 3
- c) Draw the timing diagram for the 8085 instruction IN 34H. 6
3. a) Assuming: DS=1000H, BX=2030H and SI=2020H; State the addressing mode of the following 8086 instructions and find the physical address of the source location. 5
 - i. MOV AX, [1234H]
 - ii. MOV AX, [BX]
 - iii. MOV AX, [BX+SI]
 - iv. MOV AX, [BX+SI+5]
 - v. MOV AX, [SI+4]
- b) Write an 8085 ALP to subtract two 16-bit numbers and store the result in memory locations starting from 2017H. 5
- c) Explain various assembler directives in brief. 5
4. a) Write an assembly language program to find the sum of two no. which 7

is input by the user through the key board and display the sum in screen.

- b) You have given string data "Microprocessor and Assembly language Programming". Write an ALP to print "Microprocessor Programming" from the above given data.
5. a) How interrupt processing occurs in a microprocessor? Explain vector chain and polled interrupt.
- b) What do you mean by address decoding? Design an address decoding circuit to interface $4K \times 8$ RAM, $8K \times 8$ ROM and $16K \times 8$ RAM with starting address 4000h.
6. a) Draw block diagram of 8254 PIT and explain in brief.
- b) How can we accommodate 20 interrupt sources with 8259 PIC?
- c) Explain the different control words of 8255A PPI.
7. Write short notes on: (Any two)
- a) DMA controller
- b) Macro Assembler
- c) 8085 flag register

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Microprocessor and Assembly Language
Programming

Semester: Fall

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Describe in brief the evolution of INTEL series. 8
- b) Draw the block diagram of 8085 Microprocessor. Explain about its register set. 7
- a) Draw the timing diagram of 8085 instruction LDA CBD2H. 8
- b) What is addressing modes? Describe about the different addressing modes in 8085 microprocessor. 7
- a) Describe about the format of an ALP, illustrating a simple program. 7
- b) Write an ALP for 8085 microprocessor to copy the largest value among ten values at starting address CB08H to CD00H. 8
- a) Write an ALP to find the difference between two 8-bit numbers using two's complement method and display the difference in the screen. 8
- b) What are the different components of ALP Development tool? 7
Describe their functions.
- a) Differentiate between synchronous and asynchronous bus. 5
- b) List out the possible sources of interrupts. Also Describe the Polled Interrupt hardware with necessary diagram. 10
- a) Explain 8259A modes of operation. How can we accommodate 18 interrupt sources with 8259A PIC? 8
- b) Describe in detail the working mechanism of USART with necessary diagram. 7
- Write short notes on: (Any two) 2×5
- a) Addressing Decoding
- b) Interrupt Vector Table
- c) Application of 8254 PIT

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Microprocessor and Assembly Language
Programming

Semester: Spring

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Explain the evolution of Intel Series Microprocessors starting from 16-bit architecture to 64-bit architectures. 7
- b) Draw block diagram of a Microprocessor and explain it in detail. 8
- a) Write the function, addressing modes, size and name of machine cycles for the following instructions: i) LDAX D ii) ADI 32H iii) LXI B, 2075H 6
- b) Define Instruction cycle, Machine cycle and T-states. 3
- c) Draw the timing diagram for the 8085 instruction MVI A, 32H. 6
3. a) What do you mean by Segmentation Offset Scheme in 8086 Microprocessor. Explain with suitable example. 5
- b) Write an 8085 ALP to subtract two 16-bit numbers and store the result in memory locations starting from 2075H. 5
- c) Explain various assembler directives in brief. 5
4. a) Write an assembly language program to find the sum of two number which is input by the user through the key board and display the result in screen. 7
- b) Write a procedure program for 8086 for newline and use it to display three different strings in different lines. 8
5. a) What are various sources of interrupts? Explain interrupt vector table of 8086 microprocessor. 8
- b) What do you mean by address decoding? Design an address decoding circuit to interface $4K \times 8$ RAM, $8K \times 8$ ROM and $16K \times 8$ RAM with starting address 0000h. 7
6. a) You are given a microprocessor system with clock frequency 10MHz. Write a program for 8254 PIT to generate a square wave of frequency 2KHz. 5

- b) How cascading is done to handle more than 8 interrupts using 8259 PICs? 5
- b) How cascading is done to handle more than 8 interrupts using 8259 PICs?
Explain. 5
- c) Write 8085 program for 8255 PPI to take input from input device
connected to Port B and display the value of input on the output device
connected to Port A of 8255 PPI. 2x5
7. Write short notes on: (Any two)
- a) Direct Memory Access Controller
 - b) Different types of Assemblers
 - c) 8085 flag register

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Microprocessor and Assembly Language
Programming

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- 1) Compare Microprocessor, Microcomputer and Microcontroller. 7
- 1) Which is better for high speed operation? Give reason. 8
- 1) Define Instruction cycle. Explain flags, registers and control signals available in 8085 microprocessors. 8
- 1) What is addressing mode? Explain the addressing modes of 8086 microprocessor giving appropriate examples. 7
- 1) Draw the timing diagram for the 8085 instruction MVI M,14H. 8
- 1) Write an Assembly language program to multiply two 8 bit numbers stored in the memory address D050H and E050H and if the result is less than 80H, save it to F050H else store it in FFFFH. 7
- 1) What is the role of assemblers in ALP? Explain one-pass and two-pass assemblers in brief. What is macro assembler? 8
- 1) Write an assembly language program for 8086 to compare two strings and display "Strings are same" for same strings value otherwise display "Strings are Different" in Dos Screen. 7
- 1) What is memory interfacing? Interface 4K x 8 EPROM, 8K x 8 RAM with starting address of 1000H. 8
- 1) a) What is interrupt? What are the source of interrupts? Explain Maskable/Non-maskable, vectored and non-vectored interrupt. 8
- 1) b) Describe the process to transmit and receive the serial data in 8251 USART. 7
- 1) a) Describe 8254 PIT with diagram. Write down the instructions to generate 4 KHz square waveform for 8254 PIT 8
- 1) b) What is DMA? Describe how it works with suitable illustration and block diagram. 7

7. Write short notes on: (Any two)
- a) Interrupt Vector Table
 - b) MACRO vs PROCEDURE
 - c) Memory Classification.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Microprocessor and Assembly Language
Programming

Semester: Spring

Year : 2019

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Define Op-code and operand with Example. Differentiate between microprocessor and microcontroller. 7
- b) What do you mean by instruction cycle? Draw the timing diagram of instruction MVI M,20H. 2+6
- a) Explain the instruction set of 8085 microprocessor on the basis of its operation. 7
- b) WAP to find the sum of given series $1+2^2+3^2+\dots+10^2$. Store the results in memory address 2040H and 2041H. 8
- a) Identify the size, addressing modes, T-state and function of following instructions. 7
 - i. MVI A,20H
 - ii. LDA 1234H
 - iii. CMP M
 - iv. RRC
 - v. ANA B
 - vi. ADI 0FH
 - vii. LXI H,1234H
- b) What is a macro and how can it be implemented for assembly language programming? Explain a program using macros. 8
- a) Write an assembly language program for 8086 to find the sum of two numbers which is input by the user through the key board and display the sum on the screen. 7
- b) Design an address Decoding circuit to interface an input device with eight input switches and eight LEDs output device at address 50H and 51H respectively. 8
- a) Explain the interrupt processing in detail. Describe the methods of handling multiple interrupts. 7
- b) What is IVT? Briefly describe the conditions which cause the 8086 to perform each of the following types of interrupts: Type 0, Type 1, 8

- Type2, Type 3 and Type 4.
6. a) Describe about the pin configuration of 8237 controller and explain the types of modes available in it.
- b) Draw a labelled diagram of 8254 PIT controller and write down the instructions to generate 5KHz square wave for 2854 PIT.
7. Write short notes on: (Any two)
- a) Application of PIC.
 - b) One pass and Two pass Assemblers
 - c) ALP Development tools

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Data Structure and Algorithm

Semester: Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

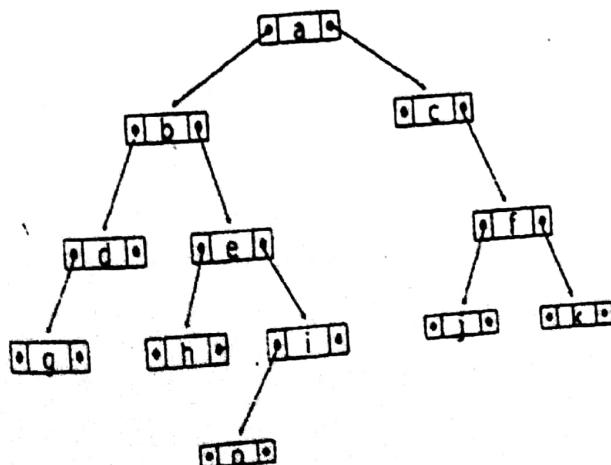
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

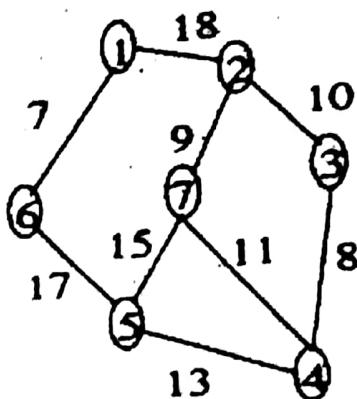
Attempt all the questions.

1. a) What is the difference between data type and data structure? How do you represent Rational number as an ADT? 7
1. b) Define stack as an ADT. Enlist any five applications of stack. Convert the given expression into postfix expression showing the content of stack at each step: 8

$$(A + B) \$ (C * D) - E$$
2. a) Discuss the merits and demerits of contiguous list and linked list. Write algorithms to insert and delete a node in queue implemented in linked list. 8
2. b) "A function or a object calls itself". Explain this statement using idea behind it. Give recursive algorithms for Fibonacci term and TOH problem. 7
3. a) Write down C module to insert an element before, between and after node of singly linked list. 8
3. b) What is AVL Tree? Determine the pre order, in order and post order traversal for the following binary tree. 7



- a) Why sorting is necessary and when radix sort is useful? Trace the following data using radix sort algorithm: 25, 57, 48, 37, 12, 92, 86, 33.
- b) Define load factor. Given input { 1, 16, 49, 36, 25, 64, 81, 4, 9, 2 } and a hash function $h(x) = x \bmod 10$ show the resulting:
- Hash table using quadratic probing.
 - Hash table using chaining.
- a) Define Big O Notation. What is parallel computing algorithm and when parallel computing algorithm is preferred over the serial one?
- b) Find the Minimum Spanning Tree and its weight of the graph using Kruskal's algorithm:



- a) Write Dijkstra's Algorithm to find the shortest path. Explain the algorithm with necessary figure.
- b) Draw the Binary Search Tree (BST) for following string "POKHARAUNIVERSITY" considering each character as information of the node in a binary search tree. Also traverse the tree in post-order, pre-order and in-preorder.
- Write short notes on: (Any two)
- Wärshall's algorithm.
 - Stable and unstable sorting.
 - Dequeue operation using linked list.

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Data Structure and Algorithm

Semester: Spring

Year : 2013
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
 Attempt all the questions.*

What is data structure? Compare and contrast between primitive and non-primitive data structure. 7

Define stack. Convert the given expression into prefix expression showing the content of stack at each step: 8

$$(A + B) * (C \$ D) - E / F$$

What is a benefit of circular queue when compared to linear queue? 8

What are the basic operations in a queue? Write an algorithm for any one of the operations.

What is a linked list? Write an algorithm to insert at the beginning of the linked list. 7

Why is doubly linked list used? Explain the implementation of a doubly linked list. 7

b) Compare and contrast between recursion and iteration. Write a recursive algorithm for generating Fibonacci sequence. 8

a) Draw the Binary Search Tree (BST) for following string considering each character as information of the node in a binary search tree. And also traverse the tree in post-order, pre-order and in-preorder: 7

DATASTRUCTURE

b) Why balance factor is used in AVL tree? Construct an AVL tree from the following data: 8

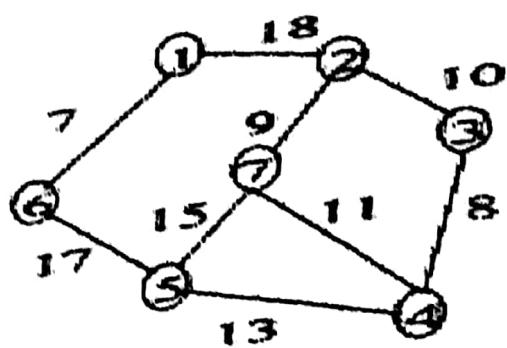
70,80,90,1,5,89,91,79,45,21,16,54

a) Using Radix sort, sort the given data: 8

P, O, K, H, A, R, A, U, N, I, V, E, R, S, I, T, Y

b) What do you mean hashing? Explain about collision resolution technique used in hashing. 7

6. a) Find the Minimum Spanning Tree and its weight of the graph using Prim's algorithm:



- b) Explain about deterministic and non-deterministic algorithm in brief. Also explain about Big-Oh notation with the help of suitable example.

7. Write short notes on: (Any Two)

- a) Greedy algorithms
- b) Bucket sort
- c) Huffman algorithm.

POKHARA UNIVERSITY

el: Bachelor
gramme: BE
use: Data Structure and Algorithm

Semester: Fall

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far practicable.

The figures in the margin indicate full marks.
Attempt all the questions.

Define data structure. Explain the different operations to be performed on data structure. 7

Write the algorithm to convert the infix expression to postfix expression to postfix expression using stack implementation. Evaluate the following expression 8

$A B C / - D E * F - * (Where A=6, B=5, C=2, D=3, E=4 and F=1)$

Write an algorithm to insert an item in circular queue in array implementation. Write assumptions you need? 7

Define list. Describe merits of linked list over contiguous list. Write an algorithm to insert an item in a static list. 8

Differentiate between singly linked list and doubly linked list. Write an algorithm for push and pop operations on stack using linked list. 8

Construct a binary tree from the following inorder and preorder sequence. 7

Preorder: F A E K C D H G B

Inorder: E A C K F H D B G

b) Write an Algorithm to build an Huffman Tree. Construct a Huffman tree for the following data item and Frequency 3+5

Data item	A	B	C	D	E	F	G	H
Frequency	22	5	11	19	2	11	25	5

b) Sort the following data by heap sort method. 7

40, 32, 75, 20, 65, 48, 88

a) Define Selection sort. Trace Quick sort algorithm for the data: 2+5

25, 57, 48, 37, 12, 92, 86, 33

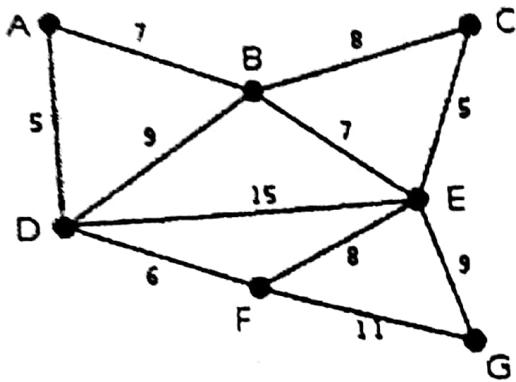
- b) Search using Binary search Technique

75, 151, 203, 275, 318, 489, 524, 591, 647, 727

8

Search 275 and 727.

6. a) Define greedy algorithm. Find minimum spanning tree for the given graph using Kruskal's algorithm. 2+6



- b) Define graph traversal. Differentiate between DFS and BFS with an example. 2+5

7. Write short notes on: (Any two) 2x5

- a) Big O notation
- b) Recursion Vs Iteration.
- c) Hash Functions and hash tables.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Semester: Spring

Year : 2014

Course: Data Structure and Algorithm

Full Marks: 100

Pass Marks: 45

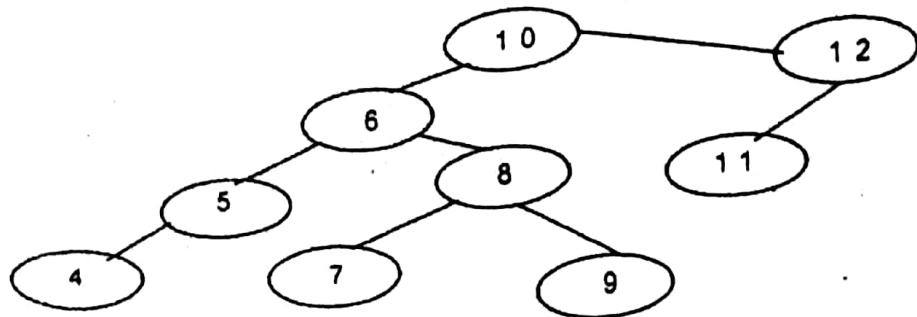
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.
Attempt all the questions.

- i) Justify the statement "Data Structure is the backbone of software programming". What is ADT? 7
- ii) Explain the basic operations of stack. Write an algorithm for insertion and deletion of an element in a stack. Also mention the condition for overflow and underflow in a stack. 8
- iii) What is infix, prefix and postfix expression? Convert the following infix expression into postfix expression showing the content of stack in each step. 7

$$P = A + (B / C - (D * E \$ F) + G) * H$$
- iv) Compare circular queue with linear queue. Write enqueue and dequeue algorithm of circular queue. 8
- v) What are the advantages and disadvantages of linear linked list? Show an algorithm to insert an element at the end and at specified position of the single linked list. 7
- vi) What is doubly linked list (DLL)? How does it differ from circular linked list (CLL). Explain with appropriate example. 8
- vii) Differentiate recursion with iteration. Write down the algorithm to solve the tower of Hanoi using recursion. 7
- viii) Generate the Huffman code for the symbol A, B, C, D, E, F with the probability of occurrence are 0.2, 0.28, 0.2, 0.16, 0.12, 0.04 respectively. Also construct Huffman tree. 8
- ix) Write the steps required to delete a node form a Binary Search Tree (BST). Re-construct the resulting BST after deleting the node 6 from the following BST. 7



- b) What is sorting? Explain the divide and conquer approach in quick sort algorithm. Trace the algorithm to sort the following unordered list. 40, 20, 10, 80, 60, 50, 7, 30, 100.
- a) Define graph. What are the difference between traversing in graph and traversing in tree? Explain with suitable example.
- b) 66, 47, 87, 90, 126, 140, 145, 153, 177, 285, 393, 395, 467, 566, 620, 735. From above data, store the values into hash table with 20 positions, using division method (key % table size) of hashing and the linear probing method for resolving collision.

Write short notes on: (Any two)

- a) Spanning tree.
- b) Deque.
- c) Serial and parallel algorithm.

8

7

8

2x5

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Data Structure and Algorithm

Semester: Fall

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Differentiate ADT and C++ class. Write an ADT for natural numbers. 7
b) Trace the algorithms to convert postfix expression with the following infix expression 8
 $((A+B)-C*D/E)\$*(H-I)*F+G$
Evaluate postfix expression obtain from above with the following values for
 $A=4, B=2, C=4, D=3, E=8, F=2, G=3, H=5$ and $I=1$.
2. a) What are the difference between stack and queue? Write enqueue and dequeue algorithm of circular queue. 8
b) What is doubly linked list (DLL) and Circular Linked List (CLL)? 7
Represent the following polynomial equation using singly linked list.
 $P(x,y,z)=3x^3yz - 5x^2y^3 + 5x^2y^3 + 8y^2x^2z - 4xy^2z^3 + 2x^7yz$
3. a) State the advantage of a linked list over contiguous list. Write the steps involved in deleting an item in a contiguous list. 8
b) How the representation of data in memory is cheaper using linked list than in array? Write an algorithm to search an element and insert a node at the specified position in a single linked list. 7
4. a) What is tree traversal? Explain preorder, inorder and postorder tree traversal by constructing expression tree of the given expression: $b*b-4*a*c$. 7
b) How does the Huffman algorithm work? Explain with a complete example. 8
5. a) Sort the following data using merge-sort algorithm. 66, 33, 40, 22, 55, 88, 60, 11, 80, 20, 50, 44, 77. 7
b) What is hashing. Explain in detail about the technique used for 8

collision resolution.

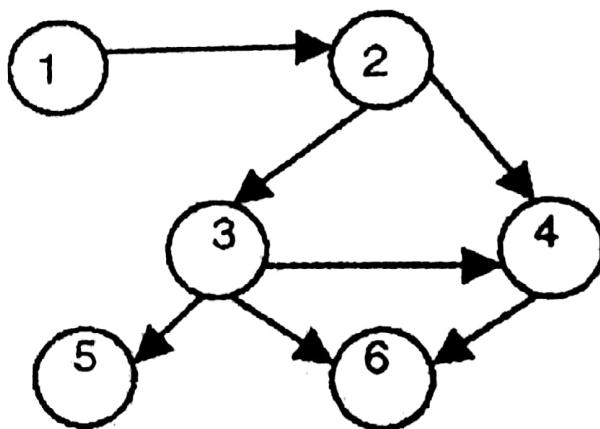
6. a) Define graph and diagraph?

Let G be the graph represented by this adjacently list.

Vertex	Adjacent list
A	F
B	C
C	B
D	A,B
E	C,D,
F	E

- i. Draw G.
- ii. Is G a directed graph?
- iii. Is G weakly connected?
- iv. Give the adjacency matrix for G.

- b) Define graph, connected graph and spanning tree. Perform the topological sort from the following graph.



7. Write short notes on: (Any two)

- a) Game Tree.
- b) Recursion versus Iteration.
- c) Big O Notation.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Data Structure and Algorithm

Semester: Spring

Year : 2015

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) "To write an efficient program, we should know about data structure." 5
- b) Explain the above statement. 5
- b) What is ADT? Explain different primitive operations that we can perform on data structures. 5
- c) List the applications of stack in computing as well as non-computing world. 5
- a) What is infix, prefix and postfix expression? Convert the following infix expression into postfix expression showing the content of stack in each step. 7
- $$P = A + (B * C - (D / E \$ F) * G) * H$$
- b) Compare circular queue with linear queue. Write Enqueue and Dequeue algorithm of circular queue. 8
3. a) How dynamic list is different from static list? What are the primitive operations that we can perform in a list? Explain with suitable example. 7
- b) What is doubly linked list (DLL) and Circular Linked List (CLL)? Write an algorithm to insert a node in specified position of doubly linked list. 8
4. a) Define BST. Construct a BST using the following data U, N, I, V, E, R, S, I, T, Y, O, F, P, O, K, H, A, R, A.
Also Perform pre-order, in-order and post order traversal 8
- b) Generate the Huffman code for the symbol A, B, C, D, E, F with the probability of occurrence are 0.2, 0.28, 0.2, 0.16, 0.12, 0.04 respectively. Also construct Huffman tree. 7
5. a) Why do we need to balance the tree? Perform the balancing algorithm 7

- according to AVL for the following sequence of numbers.
- b) Differentiate bubble sort with selection sort. Explain the divide and conquer approach in quick sort algorithm. Trace the algorithm to sort the following unordered list. 25, 30, 18, 16, 45, 40, 60, 20, 10, 7, 30, 100, 12, 14.
6. a) Define graph. What are the difference between traversing in graph and traversing in tree? Explain with suitable example.
- b) Define Hash Collision. 66, 47, 87, 90, 126, 140, 145, 153, 177, 285, 393, 395, 467, 566, 620, 735. From above data, store the values into hash table with 20 positions, using division method ($\text{key} \% \text{tablesize}$) of hashing and the linear probing and quadratic probing method for resolving collision.
7. Write short notes on: (Any two)
- Recursion vs Iteration
 - Deque
 - Serial and Parallel algorithm.

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Data Structure and Algorithms

Semester: Fall

Year : 2016
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

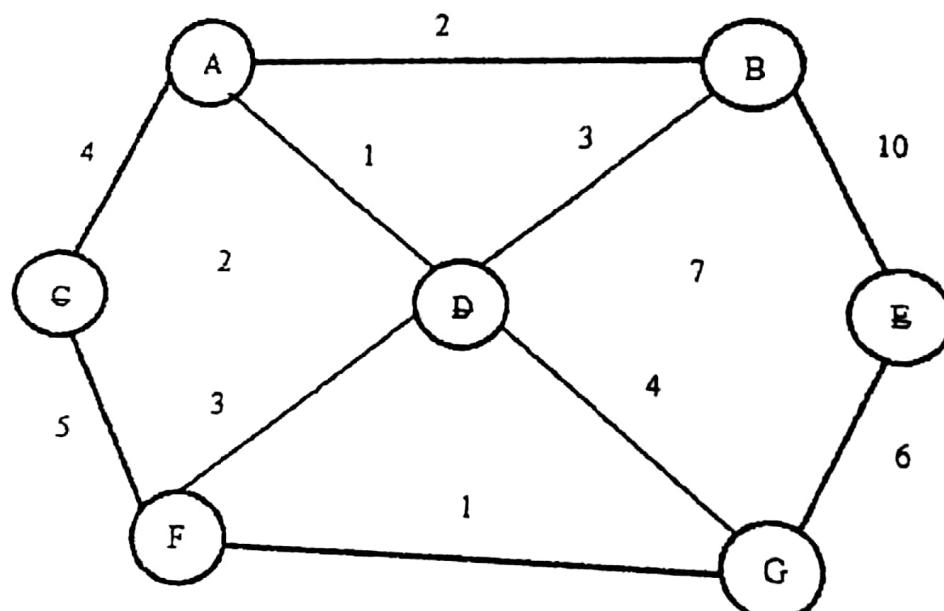
*Candidates are required to give their answers in their own words as far as practicable.
 The figures in the margin indicate full marks.
 Attempt all the questions.*

- Discuss the concept of data structure. Explain various ways of representing rational number as an ADT. 7
- Write an algorithm for conversion of infix to postfix expression. 8
- Convert the following infix expression to postfix in tabular form:
 $(a-b/c\dfrac{d}{e})^f \cdot g^h$ 7
- Differentiate between stack and queue. How do you insert and delete an element in a circular queue? Explain with an example. 8
- Differentiate between static and dynamic list. Write an algorithm to insert an element into a contiguous list. 8
- Define Enqueue and Dequeue. Explain four types of dequeue with suitable example. 8
- What is recursion? What are its advantages and disadvantages? Give the difference between recursion and iteration by taking reference of factorial function. 7
- Design a Binary tree whose pre-order and in-order traversal sequences are FAEKCDHGB and EACKFHDBG respectively. 7
- What is height balanced tree? Insert 3,2,1,4,5,6,7 in an empty AVL tree. 8
- Define Hash Function. Suppose, In a company with its 68 employees, every employee has 4 digit employee number and also assume that memory table has 100 address starting from 00, 01, 02, 03,.....99. The employee numbers are 4205, 3605, 7777, 8282, 7626, 0234, 2522, 5228, 5175, 1002. Perform division method, folding method and mid square method. Allocate the desired result in memory. 7

- b) Explain selection sort. Sort the following list using heap sort:
 31, 41, 5, 9, 36, 53, 58, 97
6. a) Explain Warshall's algorithm to find the transitive closure of a digraph. For the adjacency matrices A given below
- draw the corresponding digraph
 - find the matrix T of the transitive closure using the digraph implementation of Warshall's algorithm.

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

- b) Define shortest path algorithm. Find the shortest path from C to E using Dijkstra Algorithm.



7. Write short notes on: (Any two)
- Deterministic and Non-Deterministic algorithm
 - Quick Sort
 - Tree traversal.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Data Structure and Algorithm

Semester: Spring

Year : 2016

Full Marks: 100

Pass Marks: 45

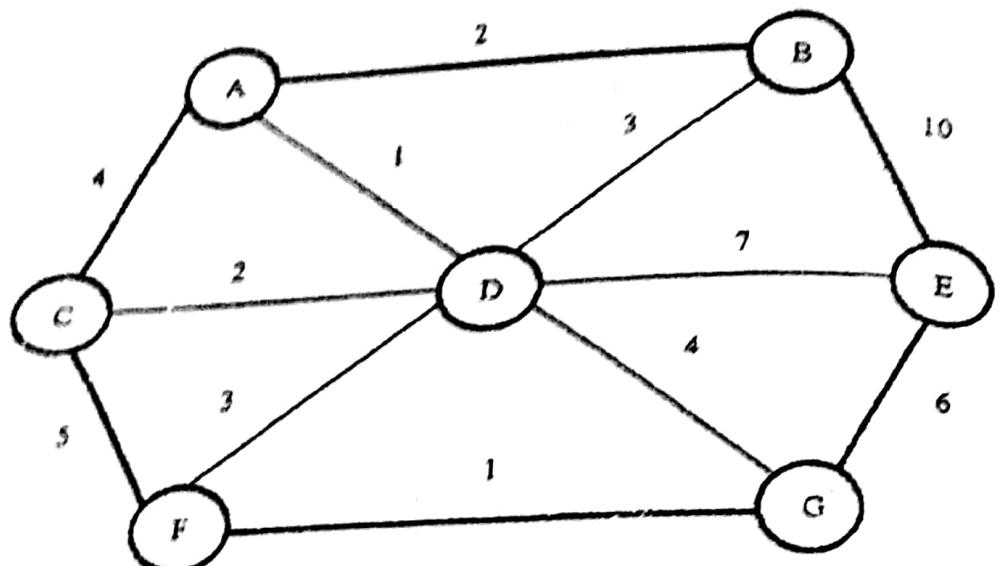
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- Differentiate between data type and data structure. What are the two parts of ADT definition? Explain. 7
- b) Differentiate between infix, prefix and postfix expression. Write an algorithm to evaluate an arithmetic expression in Postfix string. 8
- b) Define Circular Queue. Write an algorithm to add and delete an item in the circular queue. 8
- b) List basic five operations of linked list. Write code for inserting new node at beginning of the list. 7
- a) What are the advantages and disadvantages of linked list implementation over array implementation? Write algorithm for enqueue and dequeue operations on Queue using linked list. 8
- b) Explain B+ trees giving some of its application. Write the algorithm to delete an element from B+ tree. 7
- a) Mention advantages and disadvantages of recursive algorithms over iterative solutions. 5
- b) Trace quick sort algorithm for the data: 10, 22, 31, 4, 15, 28, 17, 6. 10
- a) Discuss the efficiency of binary searching. 5
- b) Define hashing and collision. Illustrate three types of collision resolution techniques with an example. 10
- a) Differentiate between Graph and Tree. Write an algorithm for Depth-First Traversal of graph. 7
- b) What is minimum spanning tree? Explain Kruskal's algorithm to get minimum cost spanning tree of following graph. 8



7. Write short notes on: (Any two)

- a) Priority Queue
- b) Min Vs Max Heap
- c) Big O notation

सुगम स्टेसनरी सलायर्स एण्ड फोटोकपी सर्विस
 बालकुमारी, ललितपुर ९८४९५९९५९२
 NCIT College

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Data Structure and Algorithm

Semester: Fall

Year : 2017
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.
 The figures in the margin indicate full marks.
 Attempt all the questions.*

- a) What is Abstract Data Types (ADT)? Explain the different primitive operations to be performed on the data structures. 5
- b) How data structure is different from data types? Explain the meaning of linear and nonlinear data structure with suitable example. 5
- c) List the applications of stack in computing as well as non-computing world. Write down the condition to check whether the element in linear queue is last element or not. Also mention how do you find the number of elements present in any queue? 5
- a) Write an algorithm to convert infix expression to postfix expression. 7
- a) Convert the following postfix expression into infix expression:
 $abc+de-fg-h+/*$ 8
- b) What is double ended queue? How does circular queue overcome the shortcoming of linear queue? Write an algorithm for traversing in circular queue. 8
- a) What are the advantages and disadvantages of Linked list? Write an algorithm to delete a node in specified position of singly linked list. 7
- b) What are the applications of linked list? Explain with suitable example to perform the addition of two polynomials using linked list. 8
- a) Construct a BST from the following elements inserted in an order. 7
 39, 45, 30, 60, 42, 35, 25, 32, 44. Also perform different tree traversals.
- b) What is weight balanced tree? Perform the AVL algorithm for following words are inserted in an order in an empty tree. BRIJESH, FIZZA, IMRAN, NAVIN, LOVELY, PRITY, SAMIT 8
- a) How recursion is different from iteration. Present your argument with 7

- suitable example for following statement: "Solving Fibonacci series using recursion is not efficient as compare with iteration".*
- b) *What is stable and unstable sorting? Trace the quick sort algorithm for following unordered list.*
- 25, 30, 18, 16, 45, 40, 60, 20, 10, 7, 30, 100, 12, 14.
6. a) *Compare set, matrix and linked list representation of graph. What are the difference between traversing in graph and traversing in tree?*
Explain with suitable example.
- b) *76, 26, 37, 59, 21, 65, 75, 49, 11. From above data, store the values into hash table with 10 positions, using division method (key% table size) of hashing and the linear probing and chaining method for resolving collision.*
7. Write short notes on: (Any two)
- a) Heap sort
 - b) Transitive closure
 - c) Big OH notation

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Data Structure and Algorithm

Semester: Spring

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- | | | |
|----|---|---|
| a) | Why data structure is needed? Explain the advantages of abstract data typing. | 7 |
| b) | Write an algorithm to evaluate an arithmetic expression in Postfix string. Apply the algorithm to evaluate: AB + C - BA + C\$ - (assume A = 1, B = 2, C = 3). | 8 |
| a) | Write an algorithm to insert an element into the queue and to delete an item from queue. | 7 |
| b) | Define doubly linked list. Explain the advantages and disadvantages of linked list over array. | 8 |
| a) | Write a program to implement a stock using array. (you can use any programming language such as C or C++ or Java) | 8 |
| b) | Write recursive function/algorithms for Binary Tree Traversals. | 7 |
| a) | Define an AVL tree. Why do you balance a tree? Explain with an example. | 7 |
| b) | Why is quick sort better than other sorting algorithms? What might be the cases where quick sort isn't better? | 8 |
| a) | Given input {1, 16, 49, 36, 25, 64, 0, 81, 4, 9} and a hash function $h(x) = x \bmod 10$. <ul style="list-style-type: none"> i. Draw Hash table using open addressing ii. Draw Hash table using chaining | 7 |
| b) | What is external sorting? Write a C function to sort a given array of positive integers using bubble sort. | 8 |
| a) | What do you mean by Shortest Path? Write Disjkstra's shortest path algorithm and explain the algorithm with suitable example. | 8 |

- b) Explain adjacency matrix and adjacency list representation of graph using an example
7. Write short notes on: (Any two)
- a) Recursion and ToH
 - b) Big O Notation
 - c) Minimum Spanning Tree

POKHARA UNIVERSITY

Semester: Fall

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Level: Bachelor
Programme: BE
Course: Data Structure and Algorithm

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

7

Define ADT with example. What are the data structures used in the following areas: Print jobs in computer, Network data model & Hierarchical data model?

8

What is the advantage of postfix expression over infix expression?

Evaluate the given expression using prefix notation.

$$A * (B + C) - (D / E)$$

(Assume A = 5, B = 6, C=2, D=12 and E=4)

8

a) Write differences between linear queue and circular queue. Write an algorithm for insert and delete operations for circular queue.

b) How many steps are required to solve TOH problem? Write the steps to solve TOH problem for 4 discs giving pictorial illustrations.

7

a) Differentiate between static and dynamic list. Write an algorithm to insert a node at the end doubly linked list.

7

b) What is circular linked list? Write an algorithm for push and pop operations on Stack using linked list.

8

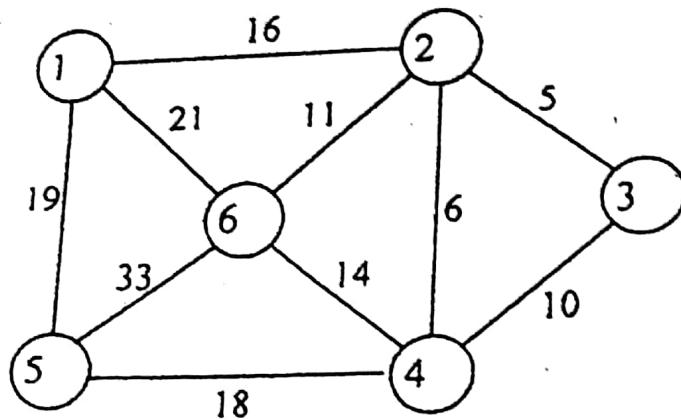
a) Suppose the following list of letters is inserted in order into an empty binary search tree. J R D T G E A M H F Q U B. Find the final tree and perform different tree traversals.

7

b) Write a structure definition to represent AVL tree. Create an AVL tree from the given set of values. 3,5,11,8,4,1,12,7,2

8

5. a) Trace quick sort for following set of values.
 43, 16, 11, 89, 35, 47, 1, 92.
- b) Define collision. What are the techniques used for collision resolution in hashing. Explain with example.
6. a) What do you mean by spanning tree of graph? Find the minimal spanning tree of the following graph using Kruskal's algorithm.



b) Explain with suitable example, BFS and DFS traversal of a graph.

7. Write short notes on: (Any two)

- a) Divide and Conquer Algorithm
- b) Radix Sort
- c) Worst Case Complexity

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Semester: Spring

Course: Data Structure and Algorithm

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.*

- a) Define abstract data type? Justify the statement "Data Structure is the backbone of software programming". 8
- b) Write the advantages of Postfix expression over the Infix expression. 7
- c) Convert the given expression into Postfix expression showing the content of stack at each step. $(A+B*C/D)+E*F-(G*H+I-J)$. 7
- d) Differentiate between recursion and iteration. Write recursive mechanism (algorithm) for solving Tower of Hanoi problem. 7
- e) Explain the advantages of doubly linked list implementation. Write algorithm for insertion and deletion in stack as linked list. 8
- f) Explain with example the different cases of balancing AVL tree after inserting a node that violates the property. 7
- g) Construct a BST from the following data and show VLR, LVR, LRV and RVL traversals 14,10,17,12,11,20,18,25,20,8,22,23. 8
- h) Define Queue. Mention the primitive operations of Queue and write the module for enqueueuer and dequeuer in Circular Queue. 8
- i) Generate the Huffman Code and also draw the Huffman tree for the following unique Character "POKHARAUNIVERSITY". 7
- j) What is sorting? Write the algorithm for quick sort. 7
- k) What is collision in hashing? What are the collision resolving techniques in hashing? Explain about separate chaining. 8
- l) Define graph and digraphs. Explain Adjacency matrix representation of graph with examples in undirected and directed graph. 8
- m) Define the minimum spanning tree. Explain Kruskal's algorithm for finding the minimum spanning tree. 7

2x

7. Write short notes on: (Any two)

- a) TOH problem
- b) Deterministic and non-deterministic algorithm
- c) Static vs dynamic list

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Data Structure and Algorithm

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.*

Give ADT of matrix. Show a sample product function to find product of two matrices. 7

What is the condition of stack overflow & stack underflow? Write down the module for stack pop & push operation. 8

a) What are the limitations of circular queue? Write an algorithm to enqueue and dequeue in circular queue. 8

b) Write a module function to insert and delete an item in the queue in circular representation. You must state assumption clearly that are needed. 7

a) Define recursion. Illustrate the steps to solve Tower of Hanoi (TOH) problem with its solution for 3 discs. 7

b) Explain Algorithm and its types. 8

a) Construct a Binary search tree after inserting the following values. 7

12 5 15 13 17 3 7 1 9

Show your binary tree after deletion of

7 15

b) What is the benefit of having a binary tree that is Height Balanced? 8

Explain all possible rotations while constructing a height balanced tree using example for each. 8

a) Write an algorithm for insertion and deletion of the node in the end of the singly Linked list. 7

b) Construct a heap from the following data and illustrate heap sort. 8

56, 103, 88, 24, 77, 89, 53, 47, 90.

a) What do you mean by transitive closure of the graph? How warshall's algorithm is used to find the transitive closure of a graph. Clarify with suitable example. 8

- b) What do you mean by spanning tree? Explain Dijkstra's algorithm to find the shortest path in graph with suitable example.
- 7
2x5
7. Write short notes on: (Any two)
- a) Explain efficiency of Sorting
 - b) AVL Tree
 - c) Link list as an ADT

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Data Structure and Algorithm

Semester: Spring

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Differentiate Linear and non-linear data structures with their traversal methods. 7

Define infix and postfix expression. In an application, the client request you to process their data in a particular format. The format states that the in the data count of 1000, first data entered in the application is the last data that comes out of the application. Write down the insert & delete mechanism for manipulation of data. 8

What is double ended queue? Write down the algorithm to implement circular queue for both insertion & deletion approach. 8

What is the best condition of the recursive function? Derive the explicit equation of ToH using Recursive Relation. 7

Let LIST be a linked list in memory. Write a procedure which adds a given value k to each element in LIST. 8

Define list. List down the operations performed in list. Explain dynamic implementation of list with suitable example. 7

Suppose the following letters is inserted in order into an empty binary search tree: U, V, P, Q, M, N, O, R, K, W, C, D. 8

i. Find the final tree T and

ii. Find the post order traversal of T

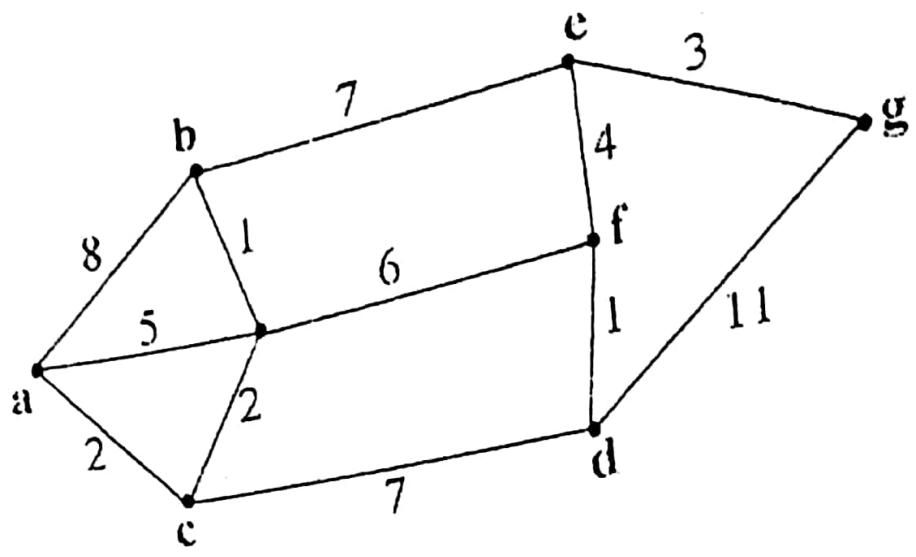
Explain the Huffman algorithm. Show your own example of Huffman algorithm. 7

Distinguish linear and binary search. Show steps to search 46 from the given data 7, 13, 36, 42, 43, 46, 85. 7

Write a program to sort the set of strings in ascending order by using bubble sort method. 8

Explain various collision resolution techniques in hashing with example. 8

Define graph traversing? Find the shortest path from a to g using Dijkstra's algorithm. 7



7. Write short notes on: (Any two)
- Adjacency matrix and Path matrix
 - Divide and Conquer algorithm
 - Radix Sort

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Engineering Mathematics III

Semester: Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

When does a system of equations said to be consistent? Test the consistency and solve 7

$$\begin{aligned}x + y + z &= 6 \\2x - y + 3z &= 11 \\4x + y + 5z &= 23\end{aligned}$$

Find eigen values and eigen vectors of the matrix 8

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

Find the radius of convergence and interval of convergence of the series 8

$$\sum_{n=0}^{\infty} \frac{(x-2)^n}{10^n}$$

OR

Find Maclaurin's series of the function $f(x) = e^x \sec x$.

Given an infinite series $\sum u_n$ of positive terms and $(u_n)^{1/n} = r$, then prove that the series is convergent if $r < 1$ and the series is divergent if $r \geq 1$. 7

Find Fourier series of 7

$$f(x) = \begin{cases} 1 & \text{for } 0 \leq x < \pi \\ 0 & \text{for } \pi \leq x < 2\pi \end{cases}$$

Apply simplex method to solve, Maximize : $Z = 15x_1 + 10x_2$ 8

subjected to : $2x_1 + 2x_2 \leq 10; 2x_1 + 3x_2 \leq 10; x_1, x_2 \geq 0$

What is a matrix? When does the inverse of a matrix exists? 7

If $A = \begin{pmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$. Find its inverse

OR

Prove that the set of vectors $(1, 1, 1), (1, 3, 2)$ and $(-1, 0, 1)$ form a basis of \mathbb{R}^3

- b) Evaluate $\iint_S \bar{F} \cdot n dA$ where $\bar{F} = (x^2, e^y, 1)$, $S: x + y + z = 1, x \geq 0, y \geq 0, z \geq 0$

5. a) State Stoke's theorem. Evaluate $\int_C \mathbf{F} \cdot \mathbf{r}'(s) ds$ where $\mathbf{F} = [y, xz^3, -zy]$

C the circle $x^2 + y^2 = 4, z = -3$

- b) If $\phi = \log(x^2 + y^2 + z^2)$ find $\text{curl}(\text{grad } \phi)$

6. a) If $\vec{r} = e^{nt} \vec{a} + e^{-nt} \vec{b}$, where \vec{a} and \vec{b} are constant vectors, show that

$$\frac{d^2 \vec{r}}{dt^2} - n^2 \vec{r} = 0$$

- b) Find $\oint_C \vec{F} \cdot d\vec{r}$ if $\vec{F} = [y^2, 2xy + \sin x, 0]$, where C is the boundary $0 \leq x \leq \frac{\pi}{2}, 0 \leq y \leq 2$ by using Stoke's Theorem.

7. Attempt all questions:

- a) Find unit tangent vector to the curve $\vec{r} = t^2 \vec{i} + 2t \vec{j} - t^3 \vec{k}$ at $t=1$.

- b) Find the smallest period of the function $f(x) = \cos x$

- c) Obtain the dual of the following problem

Minimize: $Z = 21x_1 + 50x_2$ Subject to:

$$2x_1 + 5x_2 \geq 12; 3x_1 + 7x_2 \geq 17; x_1, x_2 \geq 0$$

- d) Show that $\sum U_n = \frac{n+3}{4n+3}$ is divergent

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Spring

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- i) Define consistency of a system of linear equation. Check consistency of the system: 8

$x + y + z = 8, x - y + z = 6, 3x + 5y - 7z = 14$ and solve it if it is consistent.

- b) Define eigen-value and eigen vector of the square matrix A. Find the eigen value and corresponding vectors of the square matrix 7

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

- c) Show that the necessary condition for a vector valued function \vec{a} over a scalar valued function t to have a constant direction is $\vec{a} \times \frac{d\vec{a}}{dt} = \vec{0}$ 8

OR

Define directional derivative of the function $f = xy^2 + yz^3$ at $(2, -1, 1)$ along the direction of the normal to the surface: $x \log z - y^2 + 4 = 0$ at $(-1, 2, 1)$.

- b) State Greens theorem in plane. Evaluate $\oint_C [(3x^2 + y)dx + 4y^2 dy]$, where C is the boundary of the triangle with vertices $(0,0), (1,0), (0,2)$ counterclockwise. 7

- a) Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$, where $\vec{F} = (18z, -12, 3y)$, S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant. 8

- b) What is the physical interpretation of curl of a vector field. 7

If $\phi = \log(x^2 + y^2 + z^2)$, find $\text{curl}(\text{grad}\phi)$

- a) Find Fourier series expansion of function 8
 $f(x) = x + |x|$ for $-\pi < x < \pi$

- b) Apply simplex method to solve the problem
 Minimize $Z = 8x_1 + 9x_2$ subject to $x_1 + x_2 \geq 5, 3x_1 + x_2 \geq 21, x_1 \geq 0, x_2 = 0$

- a) Prove that for infinite series $\sum U_n$ to be convergent it is necessary that $\lim_{n \rightarrow \infty} U_n = 0$. By taking suitable example show that the converse may not be true.
- b) Find the radius, centre and the interval of the convergence of the series.

$$\sum \frac{(3x+4)^n}{\sqrt{3n+4}}$$

OR

Expand $\tan x$ in the ascending integral power of x using Maclaurin expansion and hence get the expansion of $\sec^2 x$.

- a) Construct the duality of the following linear programming problem and solve by using simplex method.
 Minimize $Z = 4x_1 + 3x_2$ subject to $2x_1 + 3x_2 \geq 1, 3x_1 + x_2 \geq 4, x_1 \geq 0, x_2 \geq 0$.
- b) Find Fourier sine and cosine series representation of the half range function $f(x) = L - x$ for $0 \leq x \leq L$

Solve the followings:

- a) If $T: R^2 \rightarrow R$ be defined by $T(x,y) = x+y$ check whether T is linear or not.
- b) Test convergence of the series

$$\frac{2}{3^2} + \frac{3}{4^2} + \frac{4}{5^2} + \dots$$
- c) Find the smallest period of the periodic function $f(x) = \sin \frac{n\pi}{L} x$.
- d) Check the exactness condition for value under the integral sign

$$\int_{(0,\pi)}^{(3,\pi/2)} (e^x \cos y dx - e^x \sin y dy)$$
, and evaluate the integral if it is exact.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Fall

Year : 2014

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

- a) Define consistency of a system of equations. Check consistency of the equations $5x+3y+7z=4$, $3x+26y+2z=9$, $7x+2y+10z=5$. If it is consistence find its solution. 7

- b) Find eigen values and corresponding eigen vectors of a square matrix 8

$$A = \begin{pmatrix} 2 & 1 & 2 \\ 0 & -1 & 3 \\ 0 & 1 & 1 \end{pmatrix}$$

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OR
Find the inverse transformation if,

$$y_1 = 3x_1 + 2x_2$$

$$y_2 = 4x_1 + x_2$$

- Define Fourier series representation of a periodic function $f(x)$ with period 2π . Find the fourier series representation of the periodic function $f(x) = \frac{x^2}{2}$ for $-\pi < x < \pi$. 7

- Minimize $Z = 4x_1 + 3x_2$, subject to $2x_1 + 3x_2 \geq 1$, $3x_1 + x_2 \geq 4$, $x_1 \geq 0, x_2 \geq 0$, by constructing dual problem(Simplex method). 8

- Test for the absolute convergence of the series $\sum_1^{\infty} (-1)^{n+1} \frac{n}{n^3 + 1}$ 8

- Find the centre, radius of convergence and interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(x-5)^n}{n5^n}$ 7

OR

Find expansion of $\log(1 + \sin x)$ as far as the term in x^4 , by using Maclaurin expansion.

- a) Define directional derivative of a function f in the direction of \vec{a} .
 Find the directional derivative of a function $f = x^2 - y^2 + 2z^2$ at the point A (1, 2, 3) in the direction of $\vec{a} = \vec{i} + \vec{j} + \vec{k}$.

OR

If $\phi = x^3 + y^3 + z^3 - 3xyz$, find out $\text{Curl}(\text{grad } \phi)$.

- b) For curve $x = 3t, y = 3t^2, z = 2t^3$ Show that:

$$[\vec{i} \ \vec{j} \ \vec{r}] = 216$$

- a) Evaluate $\iint_S \vec{F} \cdot d\vec{A}$ where $\vec{F} = (x^2, e^y, 1)$, S: $x + y + z = 1, x \geq 0, y \geq 0, z \geq 0$.

- b) Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$ where $\vec{F} = (yz, zx, xy)$ and S is the part of the

surface $x^2 + y^2 + z^2 = 1$, which lies in the first octant.

OR

State Gauss Divergence Theorem. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ by using Green's

Theorem if $\vec{F} = \left[\frac{e^y}{x}, e^y \ln x + 2x \right], R: 1 + x^4 \leq y \leq 2$

- a) Maximize the following linear programming problem by using Simplex method.

$$z = 300x_1 + 500x_2 \text{ subject to : } x_1 + 4x_2 \leq 30, x_1 + x_2 \leq 5, 2x_1 + x_2 \leq 30$$

- b) Find Fourier series of $f(x) = \begin{cases} k & \text{for } 0 \leq x < \pi \\ 0 & \text{for } \pi \leq x < 2\pi \end{cases}$

7. Answer the followings:

- a) Find the rank of $A = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$

- b) If $\phi = e^{xyz}$, find $\text{grad } \phi$.

- c) Show that $\sum U_n = \sum \frac{n+3}{4n+3}$ is divergent

- d) Let $V = \mathbb{R}^3$ be a vector space over a field F. Let $W = \{(x,y,z) : x+2y+z=0\}$, show that W be a vector subspace of V.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Engineering Mathematics III

Semester: Spring

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Prove that the inverse of a matrix if it exists, is unique. Find A^{-1} if A 8

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \\ 0 & 1 & 2 \end{bmatrix}$$

OR

Prove that $\begin{vmatrix} a^2 + 1 & ab & ac & ad \\ ba & b^2 + 1 & bc & bd \\ ca & cb & c^2 + 1 & cd \\ da & db & dc & d^2 + 1 \end{vmatrix} = 1 + a^2 + b^2 + c^2 + d^2$

b) Find the eigenvalues and eigenvectors of the matrix. 7

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

a) Define directional derivative of f in the direction of \vec{a} . find the 7
directional derivative of

$f = 4xz^3 - 3x^2yz^2$ in the direction of z-axis at P(2,-1,2).

b) State Green's theorem in a plane, and find $\oint_C \vec{F} \cdot d\vec{r}$ 8

where $\vec{F} = (2x - y - z)i + (x + y - z^2)j + (3x - 2y + 4z)k$

around the circle $x^2 + y^2 = a^2$, $Z = 0$

a) Show that the value under the integral sign is exact and evaluate the 8
integral

$$\int_{(-1,0,3)}^{(-1,1,2)} [(yz+1)dx + (xz+1)dy + (xy+1)dz]$$

- b) Evaluate the surface integral $\iint_S (\vec{F} \cdot \vec{n}) ds$, where
 $\vec{F} = (x^2, 0, 3y^2)$ and S is the portion of the plane $x+y+z=1$ in the first octant.

OR

State Stokes theorem. Find $\oint_C \vec{F} \cdot d\vec{r}$ if $\vec{F} = (y^2, z^2, x^2)$, S is the first portion of the plane $x+y+z=1$.

4. a) Find the Fourier series of $f(x) = |x|$ for $-2 < x < 2$.

- b) Find the Fourier cosine and sine series of the function

$$f(x) = \begin{cases} x & \text{if } -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \pi - x & \text{if } \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$$

5. a) Prove that the necessary condition for convergence of an infinite series $\sum u_n$ is $\lim_{n \rightarrow \infty} u_n = 0$ but this is not sufficient.

- b) Find the radius of convergence and interval of convergence of the infinite series:

$$\sum_{n=0}^{\infty} \frac{(x-4)^n(n+1)}{10^n}$$

OR

Find expansion of $\log(1 + \sin x)$ as far as the term x^4 , by using Maclaurin expansion.

6. a) Construct the dual problem corresponding to the optimum problem:
Minimize $z = 8x_1 + 9x_2$ subject to

$x_1 + x_2 \geq 5, 3x_1 + x_2 \geq 21, x_1 \geq 0, x_2 \geq 0$ and solve it by using simplex method.

- b) Apply simplex method to solve, Maximize: $Z = 15x_1 + 10x_2$
Subjected to: $2x_1 + 2x_2 \leq 10; 2x_1 + 3x_2 \leq 10; x_1, x_2 \geq 0$

7. Write short notes on:

- a) Discuss the convergence and divergence of the series $\sum_{n=2}^{\infty} \frac{1}{(\log n)^n}$

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Engineering Mathematics III

Semester: Fall

Year : 2015
 Full Marks: 100
 Pass Marks: 45
 Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- i) Find eigen values and corresponding eigen vector of the matrix 7.

$$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

- ii) Investigate for what values of p and q, the system of the equations 8

$$x + y + z = 6, x + 2y + 3z = 10, x + 2y + pz = q$$

- i. No solution.
- ii. A unique solution
- iii. An infinite number of solutions.

- iii) Show that the series: 8

$$\sum (-1)^n \cdot \frac{1}{n+3}$$

- iv) Find the radius of convergence and interval of convergence of the 7

$$\text{series } \sum_{n=0}^{\infty} \frac{(x-2)^n}{10^n}$$

OR

- Find Maclaurin's series of the function $f(x) = e^x \sec x$.

- v) Find Fourier series of the function $f(x) = \pi \sin \pi x$ ($0 < x < 1$). 7

$$p = 2L = 1$$

- vi) Find Fourier expansion of 8

$$\begin{aligned} f(x) &= 0 \text{ for } -\pi \leq x \leq 0 \\ &= 1 \text{ for } 0 \leq x \leq \pi \end{aligned}$$

$$\text{and show that } 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$$

- vii) A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where 7
 t is the time. Find the component of velocity and acceleration at time

$$t = 1 \text{ in the direction } \vec{i} - 3\vec{j} + 2\vec{k}.$$

b) Define directional derivative. If $\Phi = \log(x^2 + y^2 + z^2)$. Find:

i. $\operatorname{div}(\operatorname{grad} \Phi)$

ii. $\operatorname{Curl}(\operatorname{grad} \Phi)$

5. a) State Gauss divergence theorem and use it to evaluate

$$\iint_S \vec{F} \cdot \vec{n} dA \text{ where } \vec{F} = (e^x, e^y, e^z), S \text{ is the surface of the}$$

$$\text{cube } |x| \leq 1, |y| \leq 1, |z| \leq 1$$

OR

Find $\oint_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = (y^2, z^2, x^2)$ and S is the portion of the sphere $x^2 + y^2 + (z-1)^2 = 1, y \geq 0, z \leq 1$.

b) Evaluate $\iint_S \vec{F} \cdot d\vec{r}$ where $\vec{F} = y^2 \vec{i} + 2x \vec{j} + 5y \vec{k}$ and S is the hemisphere $x^2 + y^2 + z^2 = 4$ by using stokes theorem.

6. a) Apply simplex method to solve:

$$\text{Maximize } z = 40x_1 + 88x_2$$

$$\text{Subject to } 2x_1 + 8x_2 \leq 60$$

$$5x_1 + 2x_2 \leq 60$$

$$x_1 \geq 0, x_2 \geq 0$$

b) Find the dual of given Ipp and solve by using simplex method

$$\text{minimize } z = x_1 + 8x_2 + 5x_3 \text{ subject to}$$

$$x_1 + x_2 + x_3 \geq 8, -x_1 + 2x_2 + x_3 \geq 2, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$$

7. Do the followings:

a) Prove that product of an even function and an odd function is odd function.

b) Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be a transformation which is defined by $T(x, y) = (x+y, x-y)$, check the linearity of T .

c) Show that $\begin{vmatrix} 1+x & 2 & 3 \\ 1 & 2+x & 3 \\ 1 & 2 & 3+x \end{vmatrix} = x^2(6+x)$

d) Test the convergence and divergence of $1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \dots$

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Spring

Year : 2015

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

1. a) Define consistency of the system of linear equations. Check consistency of: $x + y + z = 8$, $x - y + z = 6$, $2x - y + z = 8$. If it is consistence, find its solution by Gauss Elimination method. 8
- b) Define Eigen values and vectors of a square matrix with its characteristics equation. If the eigen values and the corresponding eigenvector of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$. 7

2. a) Show that the infinite series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is convergent if $p > 1$ and divergent if $0 < p \leq 1$. 8
- b) Find the centre, radius of convergence and interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(x-5)^n}{n5^n}$. 7

- a) Using Simplex method, maximize $z = 150x_1 + 300x_2$ subject to the constant $2x_1 + x_2 \leq 16$, $x_1 + x_2 \leq 8$, $x_2 \leq 3.5$, $x_1 \geq 0$, $x_2 \geq 0$ 8
- b) Define periodic function. Find the fourier series representation of the periodic function $f(x) = \frac{x^2}{2}$ for $-\pi \leq x \leq \pi$ and then show that $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \dots = \frac{\pi^2}{6}$ 7

- a) Prove that the necessary and sufficient condition for the vector 8

function \vec{a} of scalar variable t to have constant direction is $\vec{a} \times \frac{d\vec{a}}{dt}$.

- b) Define gradient of scalar function. If $\phi = x^3 + y^3 + z^3 - 3xyz$, find $\text{div}(\text{grad}\phi)$ and $\text{curl}(\text{grad}\phi)$

5. a) Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$ if $\vec{F} = [x^2, e^y, 1]$

$$S: x + y + z = 1; x \geq 0, y \geq 0, z \geq 0.$$

- b) State Stokes theorem. Evaluate $\oint_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = (z, x, y)$, S : the

$$\text{hemisphere } z = (a^2 - x^2 - y^2)^{\frac{1}{2}}.$$

6. a) Construct the dual problem corresponding to optimum problem minimize: $Z = 8x_1 + 9x_2$ subject to $x_1 + x_2 \geq 5$, $3x_1 + x_2 \geq 21$, $x_1 \geq 0$, $x_2 \geq 0$ and solve it by simplex method.

- b) Find Fourier sine as well as cosine series representation of the half range function $f(x) = e^x$ for $0 < x < L$.

7. Write short notes on: (Any two)

- a) Find the directional derivative of the scalar valued function $f(x) = x^2 + y^2$, at $(1, 2)$ in the direction $\vec{a} = 2\vec{i} - \vec{j}$.

- b) Prove, $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$ is convergent

- c) Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}$ be defined by $T(x, y) = |x + y|$, check T is linear or not.

- d) Show that the alternating series $\sum_{n=1}^{\infty} (-1)^n \frac{1}{n}$, is conditionally convergent series.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Fall

Year : 2016

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define basis of vector space. Check the following vectors form a basis of R^3 or not. 7
 $(1, 2, 1), (2, 1, 0), (1, -1, 2)$

OR

Check whether the system of linear equations is consistent or not, if consistent solve it by using Gauss elimination method.

$$x + 6y + 2z = 0$$

$$7x + 3y + z = 13$$

$$x + 2y + 3z = 20$$

- b) Find Eigen value and Eigen vector of the following matrix: 8

$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

2. a) Show that the series $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$ is conditionally convergent. 7

- b) Find the center radius of convergence and interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(x-5)^n}{n 5^n}$. 8

OR

Find expansion of $\log(1 + \sin x)$ as far as the term in x^4 , by using Maclaurin expansion.

3. a) Find the Fourier series representation of the periodic function $f(x) = |x|$ for $-\pi < x < \pi$. Using it show that 8

- $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$
 b) Find Fourier sine as well as cosine series of the function 7
 $f(x) = x$ for $0 < x < L$
4. a) Define directional derivative of ϕ in the direction of \vec{a} . Find the
 directional derivative of $\phi = x^2 + 3y^2 + 4z^2$ in the direction
 $\vec{a} = -\vec{i} - \vec{j} + \vec{k}$ at $P(1, 0, 0)$.
 b) If $\vec{v} = x^2yz \vec{i} + xy^2z \vec{j} + xyz^2 \vec{k}$, find $\operatorname{div}(\operatorname{curl}\vec{v})$ and 8
 $If \vec{v} = x^2yz \vec{i} + xy^2z \vec{j} + xyz^2 \vec{k}$, find $\operatorname{div}(\operatorname{curl}\vec{v})$ and
- $\operatorname{curl}(\operatorname{curl}\vec{v})$
 5. a) Using Green's theorem, calculate $\int [(x^2 + y^2)\vec{i} - 2xy\vec{j}] \cdot d\vec{r}$ along the rectangle bounded by $y=0, y=b, x=0, x=a$ 7
 b) State Guass Divergence Theorem and hence find $\iint \vec{F} \cdot \vec{n} dA$, where 8
 $\vec{F} = (2x^2, \frac{y^2}{2}, -\cos \pi z)$ and S is the surface of the tetrahedron with vertices $(0, 0, 0), (1, 0, 0), (0, 1, 0), (0, 0, 1)$
OR
 State Stokes Theorem and using the theorem evaluate $\oint \vec{F} \cdot d\vec{r}$ if
 $\vec{F} = (y^3, 0, x^3)$, along the boundary of the triangle $(1, 0, 0), (0, 1, 0), (0, 0, 1)$
6. a) Maximize $Z = 4x_1 + x_2 + 2x_3$ subject to the constraints $x_1 + x_2 + x_3 \leq 1, x_1 + x_2 - x_3 \leq 0, x_1, x_2, x_3 \geq 0$ 8
 b) Minimize $z = 4x_1 + 3x_2$, subject to $2x_1 + 3x_2 \geq 1, 3x_1 + x_2 \geq 4, x_1 \geq 0, x_2 \geq 0$, by using dual simplex method. 7
7. Attempt all
 a) Show that vectors $(1, 0, 0), (0, 1, 0)$ and $(0, 0, 1)$ are linearly independent 4x2.
 b) Find the rank of $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 0 & 3 \\ 0 & 8 & 7 \end{bmatrix}$
 c) Check the following transformation is linear or not
 $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined by $T(x, y) = (x + 3, y)$
 d) Test for convergence of the series $\sum \frac{n+1}{2n+3}$

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Spring

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Define Eigen values and vectors of a square matrix with its characteristics equation. Find the Eigen values and the corresponding eigenvectors of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$. 8
- b) Define consistency of the system of the linear equations. Check consistency of: $x + y + z = 8$, $x - y + z = 6$, $2x - y + z = 8$. If it is consistence, find its solution by Gauss Elimination method. 7
- a) Prove the necessary condition for the convergence of an infinite series $\sum u_n$ is $n \rightarrow \infty u_n = 0$ but this not sufficient. 8
- b) Find the interval, center and radius of convergence of an infinite series $\sum_{n=1}^{\infty} \frac{2^n(x+4)^n}{n}$. 7

OR

Find the Maclaurin series representation of $y = e^{\sin^{-1}x}$, up to x^4 terms.

- a) Find fourier series of $f(x) = x + |x|$ for $-\pi < x < \pi$. 8
- b) Define periodic function with suitable example. Find the fourier series of the periodic function $f(x) = \frac{x^2}{2}$ for $-\pi < x < \pi$. Using it show that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$. 7
- a) Prove that the necessary and sufficient condition for a vector valued function \vec{r} of scalar variable t to have a constant magnitude is 8

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$$\vec{r} \cdot \frac{d\vec{r}}{dt} = 0.$$

- b) Define gradient of a scalar valued function. Find the directional derivative of the surface $f = xy^2 + yz^3$ at P (2, -1, 1) along the direction of normal to the surface $x \log z - y^2 + 4 = 0$ at the point (1, 1, 1).
5. a) Evaluate the line integral $\oint_C [(x^3 - 3y)dx + (x + \sin y)dy]$, where C : the boundary of a triangle with vertices (0,0), (1,0), (0,2) along anticlockwise direction.
- b) Evaluate $\iint_S (\vec{F} \cdot \vec{n})dA$, where $\vec{F} = 4x\vec{i} - 2y^2\vec{j} + z^2\vec{k}$ and S is the surface of the region bounded by $x^2 + y^2 = 4$, $z = 0$, $z = 3$.

OR

- State Stokes theorem. Evaluate $\oint_F \vec{F} \cdot d\vec{r}$,
where $\vec{F} = 4z\vec{i} - 2x\vec{j} + 2x\vec{k}$, C is the circle $x^2 + y^2 = 1$, $z = y + 1$.
6. a) Maximize $z = x_1 + x_2 + x_3$ subjected to the constraints
 $4x_1 + 5x_2 + 8x_3 \leq 12; 8x_1 + 5x_2 + 4x_3 \leq 12; x_1 \geq 0; x_2 \geq 0$.
- b) Minimize $z = 4x_1 + 3x_2$ such that
 $2x_1 + 3x_2 \geq 1; 3x_1 + x_2 \geq 4; x_1 \geq 0; x_2 \geq 0$, by constructing duality
7. Attempt all
- a) Test the convergence and divergence of series $\frac{2}{9} + \frac{3}{16} + \frac{1}{25} + \dots$
- b) Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}$ be defined by $T(x,y) = |x+y|$, Check T is linear or not.

c) Find the rank of the matrix:

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 2 & 0 \\ -3 & -2 & 1 \end{bmatrix}$$

d) If $\vec{r} = \vec{a}e^{nt} + \vec{b}e^{-nt}$ where \vec{a} and \vec{b} are constant vectors. Show that

$$\frac{d^2\vec{r}}{dt^2} - n^2\vec{r} = 0.$$

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Fall

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

- a) When a set of simultaneous equations is said to be inconsistent? Test for consistency and solve using Gauss elimination method. 8
 $-x+3y-2z=7, 3x+3z=-3, 2x+y+2z=-1$
- b) Find eigen values and eigen vector of the Matrix: 7
- $$A = \begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$$
- a) Test the convergence and divergence of the infinite series 8
 $\sum [\sqrt{n^3 + 1} - \sqrt{n^3 - 1}]$
- b) Find the interval and radius of convergence of the power series 7
- $$\sum_{n=0}^{\infty} \frac{x^{2n+1}}{n!}$$

OR

Find expansion of $e^{\sin^{-1} x}$ as far as the term in x^4 , by using Maclaurin expansion.

- a) Find the Fourier series of $f(x)=x^2$ for $-\pi < x < \pi$ and hence find the value of $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ 8
- b) Find the Fourier sine and cosine series of the function $f(x) = x$ for $0 < x < \pi$. 7
- a) Maximize $z = 4x_1 + x_2 + 2x_3$, subject to $x_1 + x_2 + x_3 \leq 1$,
 $x_1 + x_2 - x_3 \leq 0$, $x_1 \geq 0$, $x_2 \geq 0$ and $x_3 \geq 0$ by using simplex method. 8
- b) Construct the dual problem corresponding to the optimum problem : 7

Minimize $z = 4x_1 + 3x_2$ subject to
 $4x_1 + 5x_2 \geq 1$; $3x_1 + x_2 \geq 4$; $x_1 \geq 0, x_2 \geq 0$ and solve it by using simplex method.

5. a) A particle moves on the curve $x = t^3 + 1$, $y = t^2$, $z = 2t + 5$ where t is the time. Find the component of velocity and acceleration at $t = 1$ in the direction of $\vec{i} - \vec{j} + 3\vec{k}$.
- b) Define Divergence and Curl of a vector. If $\phi = \log(x^2 + y^2 + z^2)$ find $\text{div}(\text{grad } \phi)$ and $\text{curl}(\text{grad } \phi)$.
6. a) State Greens theorem in plane. Evaluate $\oint_C [5xydx + x^3dy]$, where C is the closed curve consisting of the graph of $y = x^2$ and $y = 2x$ between the points $(0, 0)$ and $(2, 4)$.

OR

State Stoke's theorem. Using the theorem evaluate $\oint_C \vec{F} \cdot d\vec{r}$, where

$$\vec{F} = [-5y, 4x, z], C: \text{circle } x^2 + y^2 = 25, z = 1.$$

b) Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$ if $\vec{F} = [x^2, e^y, 1]$

S: $x + y + z = 1, x \geq 0, y \geq 0, z \geq 0$

7. Attempt all

- a) Find the rank of $A = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 1 & 5 \\ 2 & 4 & 8 \end{bmatrix}$
- b) Find the inverse of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
- c) Check the following transformation is linear or not?
 $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined by $T(x, y) = (x + 3, y)$
- d) Test the convergence and divergence of infinite series

$$\frac{2}{9} + \frac{3}{16} + \frac{4}{25} + \dots$$

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Engineering Mathematics III

Semester: Spring

Year : 2017
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State the condition for a set of simultaneous equations to be consistent? Show that the set of simultaneous equations is consistent and solve it using Gauss elimination method. 7

$$3x-y+z=2, x+5y+2z=6, 2x+3y+z=0$$

- b) Find the eigen values and eigen vectors of the matrix 8

$$\begin{bmatrix} 3 & 1 & 0 \\ 1 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

2. a) Find the directional derivative of $f = 4xz^3 - 3x^2yz^2$ in the direction of z-axis at P (2, -1, 2). 7

- b) Show that the vector $\vec{F} = (yz)\vec{i} + (xz)\vec{j} + (xy)\vec{k}$ is conservative vector field and find the function ϕ such that $\vec{F} = \nabla\phi$. 8

3. a) Find the flux integral of $\vec{F} = (x, y, z)$ through the surface S, where S is the portion of the plane $2x + 3y + z = 6$ in first octant. 7

- b) State Stoke's Theorem and apply it to evaluate $\oint_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = yz\vec{i} + xy\vec{j} + xz\vec{k}$ 8

OR

Using divergence theorem find $\iint_S \vec{F} \cdot \hat{n} ds$ where $\vec{F} = y^2 e^z \vec{i} - xy\vec{j} + x \tan^{-1} y \vec{k}$ and S is the surface of the region bounded by the coordinate planes and the plane $x + y + z = 1$.

4. a) State and prove P-test for hyperharmonic series. 7

- b) Find the radius of convergence and interval of convergence of the infinite series: 8

$$\sum_{n=0}^{\infty} \frac{(x-4)^n (n+1)}{10^n}$$

OR

Find expansion of $e^{\sin x}$ upto the forth power of x by using Maclaurin expansion.

5. a) Find the fourier series of the periodic function

$$F(x) = x - x^2 \text{ for } (-\pi < x < \pi)$$

- b) Find Fourier sine as well as cosine series of the function

$$f(x) = \pi - x \text{ for } 0 < x < \pi.$$

6. a) Maximize the total output $z = x_1 + x_2 + x_3$ subject to input constraints

$$4x_1 + 5x_2 + 8x_3 \leq 12, 8x_1 + 5x_2 + 4x_3 \leq 12$$

- b) Construct the dual problem corresponding to the optimum problem:

$$\text{Minimize } z = 20x_1 + 30x_2 \text{ subject to}$$

$$x_1 + 4x_2 \geq 8; x_1 + x_2 \geq 5; 2x_1 + x_2 \geq 7, x_1 \geq 0, x_2 \geq 0$$

and solve it by using simplex method

7. Attempt all questions

4x2

- a) Prove that product of two odd functions is an even function
- b) Check the following transformation is linear or not? $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined by $T(x, y) = (x, -2y)$
- c) If $f(x, y, z) = xyz$, show that $\nabla \cdot (\nabla f) = 0$
- d) Test the convergence of the series $1 - \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} - \frac{1}{4\sqrt{4}} + \dots$

सुगम स्टेनरे सल्लायर्स एण्ड फोटोकपी सर्विस
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NCIT College

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Fall

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

7

- a) Check the consistency of the system of the equations and solve

$$2x + 5y + 6z = 13$$

$$3x + y - 4z = 0$$

$$x - 3y - 8z = -10$$

8

- b) Define Eigen values and vectors of a square matrix with its characteristics equation. Find the Eigen values and the corresponding eigenvectors of the matrix

$$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

- a) Define basis of vector space over a given field F. Show that 7
 $\{(1, 1, 1), (1, 2, 1), (2, 3, 3)\}$ forms a basis for R^3 .

- b) Apply simplex method to Minimize $Z = 5x_1 - 20x_2$ subjected to the constraints; $-2x_1 + 10x_2 \leq 5$, $2x_1 + 5x_2 \leq 10$, $x_1, x_2 \geq 0$ 8

- i. a) Prove that if an infinite series $\sum u_n$ is convergent then $\lim_{n \rightarrow \infty} u_n = 0$. 7
 By taking suitable example show that $\sum u_n$ is not convergent even if $\lim_{n \rightarrow \infty} u_n = 0$.

- b) Find the center radius of convergence and interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{(-1)^n(2x-1)^n}{n6^n}$ 8

OR

Use Maclaurin's theorem to expand $f(x) = e^{\sin x}$ in powers of x upto four terms.

- a) Find fourier series of $f(x) = x + |x|$ for $-\pi < x < \pi$. 7
 b) Find the fourier cosine series as well as sine series of the function $f(x) = x^2$ for $0 < x < L$ 8

5. a) Find the dual of given LPP and solve by using simplex method
Minimize $z = x_1 + 8x_2 + 5x_3$ subject to $x_1 + x_2 + x_3 \geq 8$, $-x_1 + 2x_2 + x_3 \geq 2$,
 $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$. 8
- b) Find the directional derivative of $f = xy^2 + yz^3$ at $(2, -1, 1)$ along the direction of the normal to the surface $x \log z - y^2 + 4 = 0$ at $(-1, 2, 1)$. 7
6. a) Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$ where $\vec{F} = (x^2, e^y, 1)$ where S is the portion of the plane $x + y + z = 1$ lying in the first octant. 8
- OR**
- Using Stokes Theorem evaluate $\oint_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = (y, \frac{z}{2}, \frac{3y}{2})$ and C is the circle $x^2 + y^2 + z^2 = 6z$, $z = x + 3$.
- b) Show that the value under integral sign $\int_{(1,0,2)}^{(-2,1,3)} (6xy^3 + 2z^2) dx + 9x^2y^2 dy + (4xz + 1) dz$ is exact and evaluate it. 7
7. Attempt all questions. 2.5x
- a) Check the following transformation is linear or not?
 $T: R^2 \rightarrow R^2$ be defined by $T(x, y) = (x + 2, y)$
- b) Test the convergence and divergence of series $\frac{2}{9} + \frac{3}{16} + \frac{4}{25} + \dots$
- c) Find the acceleration of the curve $\vec{r} = (t, t^2, t^3)$ at $t=1$.
- d) Check if the function $f(x) = x^3$ for $\frac{-\pi}{2} < x < \frac{3\pi}{2}$ is odd or even.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Engineering Mathematics III

Semester: Spring

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) State condition for a set of simultaneous equations to be consistent? 7

Show that the set of the equations are consistent and solve by Gauss Elimination method. $3x-y+z=0$, $x+5y+2z=6$, $2x+3y+z=0$.

- b) State Cayley -Hemilton Theorem Find A^{-1} by using it. 8

$$A = \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$$

- a) By using Simplex method, Maximize $Z = 20x_1 + 20x_2$ subject to $-x_1 + x_2 \leq 1$, $x_1 + 3x_2 \leq 15$, $3x_1 + x_2 \leq 21$, $x_1 \geq 0$, $x_2 \geq 0$. 7

- b) Construct the dual problem corresponding to the optimum problem: 8
Minimize $Z = 8x_1 + 9x_2$, subject to $x_1 + x_2 \geq 5$, $3x_1 + x_2 \geq 21$, $x_1, x_2 \geq 0$. Also solve it by using simplex method.

- i. a) Show that the alternating series $u_1 - u_2 + u_3 - u_4 + \dots$ in which each term is numerically less than the preceding term and $\lim_{n \rightarrow \infty} u_n = 0$, is 7

convergent. And using it show that the series $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$ is convergent.

- b) Find the radius of convergence and interval of convergence of the infinite series: 8

$$\sum_{n=0}^{\infty} \frac{10^{n+1}}{3^{2n}} x^n$$

OR

Find expansion $e^x \sec x$, by using Maclaurin expansion.

4. a) Find the Fourier series of $f(x) = \frac{\pi x^3}{2}$ for $0 < x < 2\pi$ 7
b) Find the fourier sine series for $f(x) = 2 - x$ for $0 < x < 2$ and hence 8
deduce $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$
5. a) Show that a necessary and sufficient condition for a vector function of a scalar variable to have a constant magnitude is $\vec{a} \cdot \frac{d\vec{a}}{dt} = 0$ 7
b) Define directional derivative of the function f in the direction \vec{a} . Find directional derivative of $f = xy^2 + yz^3$ at $(2, -1, 1)$ along the direction of the normal to the surface 8

S: $x \log z - y^2 + 4 = 0$ at $(-1, 2, 1)$.

6. a) State Greens theorem in plane. Evaluate $\oint [5xydx + x^3dy]$, where C is the closed curve consisting of the graph of $y = x^2$ and $y = 2x$ between the points $(0, 0)$ and $(2, 4)$. 7
b) Evaluate $\oint_C (\vec{F} \cdot d\vec{r})$ by using stokes theorem where $\vec{F} = -3y\vec{i} + 3x\vec{j} + z\vec{k}$ and circle (c): $x^2 + y^2 = 4$, $z=1$ 8
7. Attempt all the questions: 2.5x
- a) Check the linearly dependence and independence of the vectors $\{(1, 1, 1), (1, 2, 1), (2, 3, 3)\}$ 4
- b) Find the rank of Matrix $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 0 & 3 \\ 0 & 8 & 7 \end{bmatrix}$
- c) Find the Tangent vector of the curve $\vec{r} = (t, t^2, t^3)$ at $t = 1$
- d) Prove, $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$ is convergent

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2019

Programme: BE

Full Marks: 100

Course: Engineering Mathematics III

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Check whether the system of linear equations is consistent or not, if consistent solve it by using Gauss elimination method 8

$$x+6y+2z=0$$

$$7x+3y+z=13$$

$$X+2y+3z=20$$

- b) Define eigen value and eigen vector. Find eigen values and eigen vectors of the matrix. 7

$$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

2. a) Show that if the infinite series $\sum u_n$ is convergent then $\lim_{n \rightarrow \infty} u_n = 0$. 7

With a suitable example, prove that the converse may not be true.

- b) Find the interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{10^{n+1} x^n}{3^{2n}}$. 8

OR

Find the expansion of $e^{\sin x}$ upto the fourth power of x by using Maclaurin Expansion.

3. a) If a particle is moving with acceleration $12\cos 2t \vec{i} - 8\sin 2t \vec{j} + 16t \vec{k}$ 7
at time t, find its velocity \vec{v} and displacement \vec{r} at time t. Given that $\vec{v} = \vec{0}$ and $\vec{r} = \vec{0}$ when $t = 0$.

- b) Define Divergence and Curl of a vector. If $\phi = \log(x^2 + y^2 + z^2)$ 8
find $\operatorname{div}(\operatorname{grad} \phi)$ and $\operatorname{curl}(\operatorname{grad} \phi)$.

1. a) Define surface integral of \vec{F} on the surface S. Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ 8

where $\vec{F} = (x^2, e^x, 1)$, where S is the surface $x + y + z = 1$,
 $x \geq 0, y \geq 0, z \geq 0$.

- b) Find $\iint_S \vec{F} \cdot \hat{n} dA$ where $\vec{F} = (4x, x^2y, -x^2z)$, S is the surface of the 7
tetrahedron with vertices $(0,0,0), (1,0,0), (0,1,0), (0,0,1)$

5. a) Find Fourier series of the function $f(x) = x^2$ for $-\pi < x < \pi$ and 7
hence deduce $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$

- b) Find the Fourier sine as well as cosine series representation of the half 8
range function $f(x) = x^2$ for $0 < x < 1$.

6. a) Using simplex method, Maximize $z = 5x_1 + 3x_2$ subject to $x_1 + x_2 \leq 2$, 7
 $5x_1 + 2x_2 \leq 10$, $3x_1 + 8x_2 \leq 12$, $x_1 \geq 0, x_2 \geq 0$.
b) Construct the dual problem corresponding to the optimum problem: 8
Minimize $z = 8x_1 + 9x_2$ subject to $x_1 + x_2 \geq 5$, $3x_1 + x_2 \geq 21$, $x_1 \geq 0, x_2 \geq 0$, and
solve it by using simplex method.

7. Attempt all questions: 10

- a) Find the rank of $A = \begin{pmatrix} 1 & 4 \\ 2 & 0 \end{pmatrix}$.

- b) Test the convergence and divergence of series

$$\frac{2}{9} + \frac{3}{16} + \frac{4}{25} + \dots$$

- c) Check odd, even or neither of the function:

$$f(x) = \begin{cases} \frac{1}{7} + x & \text{for } -\frac{1}{2} < x < 0 \\ \frac{1}{7} - x & \text{for } 0 < x < \frac{1}{2} \end{cases}$$

- d) Evaluate $\int_{(-1,2)}^{(3,1)} [(y^2 + 2xy)dx + (x^2 + 2xy)dy]$

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Engineering Mathematics III

Semester: Spring

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

7

1. a) Solve by using Gauss elimination method

$$4x - 8y + 3z = 16, -x + 2y - 5z = -21, 3x - 6y + z = 7$$

8

- b) Using cayley Hamiltan Theorem find the inverse of

$$A = \begin{bmatrix} 7 & -1 & 3 \\ 6 & 1 & 4 \\ 2 & 4 & 8 \end{bmatrix}$$

7

2. a) State and prove the leibnitz's theorem for alternating series and hence test the convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n^3+1}$ 8

- b) Find the centre, radius and interval of convergence :

$$\sum_{n=1}^{\infty} \frac{(-1)^n (2x-1)^n}{n 6^n}$$

OR

Define Maclaurin series of function $f(x)$ and find the expansion of $\tan x$ upto three terms and hence obtain the expansion of $\sec^2 x$.

3. a) A function $f(x)$ defined by $f(x) = x^2$ for $0 \leq x \leq L$ Find the Fourier cosine series. 7

- b) Find Fourier sine as well as cosine series of the function $f(x) = x$ for $0 < x < 1$ 8

4. a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point $P(1, 2, 3)$ in the direction of line PQ where Q is the point $(5, 0, 4)$ 7

- b) If θ is the acute angle between the surfaces $xy^2z = 3x + z^2$ and

8

$3x^2 - y^2 + 2z = 1$ at the point $(1, -2, 1)$. Show that $\cos \theta = \frac{3}{7\sqrt{6}}$

7

5. a) Evaluate the line integral $\int_C \bar{F} \cdot d\bar{r}$, where $\bar{F} = (1, xy, yz)$ and S is the surface $x^2 + y^2 \leq z$, $y \geq 0$, $z \leq 4$ 8

- b) State Gauss divergence theorem and using it, evaluate $\iint_S \bar{F} \cdot \hat{n} ds$, where $\bar{F} = 2x^2 \bar{i} - y^2 \bar{j} + 4xz^2 \bar{k}$ and S is the region bounded by the cylinder $y^2 + z^2 = 3$ and $0 \leq x \leq 2$, $y \geq 0$ and $z \geq 0$.

7

6. a) Solve the following Linear programming problem using the simplex method.

Maximize $z = 30x_1 + 20x_2$ subject to:

$$-x_1 + x_2 \leq 5$$

$$2x_1 + x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

- b) Solve the linear programming problem by Simplex method constructing its duality: Minimize $z = 20x_1 + 30x_2$ Subject to $x_1 + 4x_2 \geq 8$, $x_1 + x_2 \geq 5$, $2x_1 + x_2 \geq 7$, $x_1 \geq 0$, $x_2 \geq 0$ 8

8

4x2

5

7. Attempt all the questions.

- a) Check the following transformation is linear or not?

$T: R^2 \rightarrow R^2$ be defined by $T(u, v) = (u, v+3)$

- b) Find the unit tangent vector to the curve $\bar{r} = (t, t^2, t^3)$ at $t = 1$

- c) Test the convergence of the series: $1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \dots \dots \dots$

- d) Evaluate the integral

$$\int_{(-1,2)}^{(3,1)} [(y^2 + 2xy)dx + (x^2 + 2xy)dy]$$

24 Aug
POTKHARA UNIVERSITY
Level: Bachelor
Programme: BE
Course: Software Engineering Fundamentals

Semester - Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

- a) What is evolutionary software process model? Explain. Also show that as you move outward along the process flow path of an evolutionary model. What can you say about the software that is being developed or maintained? 7
- b) What are the qualities that should be considered while measuring software? Explain Function Point metrics with example. 8
- b) How might the completion time and costs be estimate for a new software engineering contract? Explain two estimating techniques. 8
- b) What is the purpose of clean room engineering in software quality assurance? Explain in detail 7
- a) Software requirements analysis is unquestionably the most communication intensive step in the software engineering process. What causes the communication path to break down? Also explain how a system analyst will address the issue of job security in requirement gathering phase due to implementation of an automated software system. List all the possible solutions that will be of help to minimize the problem 8
- b) What do you understand by the term SCM? Which components of software can undergo configuration management? What is the role of a baseline and SCIs in SCM process? Explain with necessary figure. 7
- a) A program reads three integer values. The three values are interpreted as representing the lengths of sides of triangle. The program prints a message the states whether the triangle is scalene, isosceles or equilateral. Derive a flow graph for the program and apply basis path testing to develop test cases that will guarantee that all the statements in the program have been tested. Execute all the cases and show your 8

116 1

calculations.

- b) What are different software testing strategies? Is unit testing possible or even desirable in all circumstances? Provide examples to justify your answer.
5. a) A country Bus Company owns a number of buses. Each bus is allocated to a particular route, although some routes may have several busses. Each route passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a garage where busses are kept and each of the busses are identified by the registration number and can carry different numbers of passengers, since the vehicles vary in size and can be single or double-decked. Each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers' have an employee number, name, address, and sometimes a telephone number.
- I. Identify the entities from the above problem and model it into a ER-diagram
 - b) What is object? "Messages are means by which objects interact". Agree or disagree with reason
6. a) Explain the transition from Analysis to Design model with necessary figure. Illustrate all the necessary components of an Analysis model and their equivalent state in the Design model.
- b) Explain the Object design process with relevant figures. How design patterns help in a good design?
7. Write short notes on any two:
- a) Partitioning of Analysis Model
 - b) Granularity in software design
 - c) Data dictionary,

POKHARA UNIVERSITY,

Level: Bachelor
Programme: BE
Course: Software Engineering Fundamentals

Semester: Spring

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- (a) Why do you need a process model to be followed in order to develop a software? Explain spiral model. 8
- (b) Compute the function point value for a project with the following information domain characteristics. 7
- Number of user input: 32
Number of user output: 60
Number of user inquiries: 24
Number of files: 8
Number of external interface: 2
- (a) What do you mean by Quality of Conformance and Quality of Design? Elaborate the Activities of the SQA Group. 8
- (b) "If you do not actively attack the risk, the risk will attack you". Justify your statement. Differentiate between predictable and unpredictable risks. 7
- (a) Why is SQA needed? Explain the components of the OO analysis model. 8
- (b) Why is Software Designing an important job? Explain Modularity Concept along with the five criteria for effective modular system. 7
- (a) What are analysis model elements? 8
- (b) Explain the transform mapping and transaction mapping. How they are related for software? 7
- (a) Differentiate between white-box testing and black box testing. 8
- (b) Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment: 7

If ($x > y$)

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Min = xi

Else

Min = yi

End if

6. a) "Message passing is the way through which objects communicate to each other". Is it true, if then validate your answer.
- b) Describe transformation from OOA model to OOD model.
7. Write short notes on: (Any two)
- a) Software Requirements Specification (SRS)
 - b) Domain Analysis
 - c) Software Architecture.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester: Fall

Year : 2014

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) List out the characteristics of Software. Explain Component Based Development process highlighting its advantages over conventional approach. 7
- b) How software metrics does helps in enhancing software quality. A MIS system for the college is to be developed in which the estimated lines of codes (LOC) is calculated to be 45,000 and a review of the historical data reveals that the average productivity for this type of system is 350 LOC/pm and the labor rate is Rs. 6,500 per month. What would be the estimated project cost and the estimated effort for this software package? 8
- a) Define Risk Projection. Describe different risk categories to be considered during software development. 8
- b) Describe cost of quality. How do you perform Formal technical Review? 7
- a) Why is SQA needed? Discuss how SQA activities are carried out to help software quality. 8
- b) What do you mean by version control? Why is configuration audit essential during software development process? 7
- a) "Analysis starts with data modeling". Describe the concept of data modeling. 8
- b) Explain the transition from Analysis to Design model with necessary figure. Illustrate all the necessary components of an analysis model and their equivalent state in the design model. 7
- a) What do you mean by system testing? Discuss the different types of system testing. 8

- b) Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment:

```
x=10  
y=5  
z=2  
if x>y and x>z  
max=x  
else if y>z  
max=y  
else max=z
```

6. a) Describe the different characteristics of object oriented program.
b) What are the various components required for object oriented analysis model?
7. Write short notes on: (Any two)
a) ER Diagram
b) Object Oriented Design
c) SRS.

2x5

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester: Spring

Year : 2014

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- Explain the terms people, product, process and project. What do you mean by umbrella activity in software process? 7
- An Air Line Reservation System is to be developed in which the lines of codes is calculated to be 37,000 and a review of the historic data reveals that the average productivity for this type of system is 500(LOC/pm) and the labor rate is Rs. 8,500 per month. What would be the estimated project cost and the estimated effort for this software package? 8
- What are the software risks? Explain different categories of risks associated with software projects. 8
- As a project manager, how can you ensure customer that your software product has quality? Explain FTR as a measure to maintain the quality of a software project. 7
- What is the need of SCM activities? Why is Configuration audit essential during software development process? 8
- "Analysis starts with data modeling". Describe the concept of data modeling. 7
- Explain the transition from Analysis to Design model with necessary figure. Illustrate all the necessary components of an analysis model and their equivalent state in the design model. 7
- Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment: 8

```
if {x<10}
print "x is less than 10"
else if x<20
```

```
print "x is between 10 and 20" Min= y1  
else if {x<30}  
print "x is between 20 and 30"  
else  
print "greater than 30"
```

5. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects?
- b) Explain the various components required for object oriented analysis model.
6. a) What are the test cases? Give the different way to design test-cases. Are they related to system testing? Justify your answer.
- b) Why is design process important? Briefly explain the different levels of designs?
7. Write short notes on: (Any two)
- a) Version Control and Change Control.
 - b) Quality Standard.
 - c) Facilitated Action Specification Technique.

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2015

Programme: BE

Full Marks: 100

Course: Software Engineering Fundamentals

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

What is evolutionary software process model? Explain. Also show that as you move outward along the process flow path of an evolutionary model, what can you say about the software that is being developed or maintained? 8

Given data for a Web based social networking site developed by RBN Software Developers: 7

Numbers of User Input : 97

Numbers of User Outputs: 52

Numbers of User Inquiries: 48

Numbers of External Interfaces: 30

Numbers of Logical Files: 60

Assuming that the complexity of the given website development is average, compute the function point. If the productivity of the RBN S/W Developers is 32FP/P-M, and their salary structure is Rs.13000 per months on average, estimate total cost of the software.

i) What do you understand by the term SCM? Which components of software can undergo configuration management? What is the role of a baseline and SCIs in SCM process? Explain with necessary figure. 8

ii) Quality and reliability are related concepts but are fundamentally different in a number of ways. Discuss them. 7

iii) A Country Bus Company owns a number of busses. Each bus is allocated to a particular route, although some routes may have several busses. Each route passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a garage where busses are kept and each of the busses are identified by the registration number and can carry different numbers of passengers, since 8

the vehicles vary in size and can be single or double-decked. Each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers have an employee number, address and sometimes a telephone number.

- i. Identify the entities from the above problem and model it into a ER-diagram.
- b) What do you mean by dynamic estimation model? Is "Software Equation" a dynamic estimation model? Justify your answer.
4. a) Consider the following piece of program, which assumes a large integer C and an array A [0 .. C]. It is intended to assign the maximum of A to the variable max.

```
Max = A [0];
I = 1;
While (I < C) {
    I = I + 1;
    If (A [I] > Max)
        {
            Max = A [I];
        }
}
```

For the above program design a test case and recommend a testing technique. Justify your recommendation.

- b) What are the various types of software risks? Discuss risk mitigation strategies.
5. a) Explain why encapsulation, inheritance, and polymorphism are three important characteristics of object-oriented systems.
- b) How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design.
6. a) Differentiate between white-box testing and black box testing. What are the attributes of good test? Explain.
- b) Explain the translation of OOA model to OOD model.
7. Write short notes on: (Any two)
 - a) Data dictionary.
 - b) Design Notations.
 - c) Granularity in software design.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Software Engineering Fundamentals

Semester: Spring

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the characteristics of software? Which model would you use for risk driven software development? Explain. 8
- b) What are metrics, measures and indicators? Compute the function point value for a project with the following information domain characteristics : 7

No. of user inputs	: 39
No. of user outputs	: 53
No. of user inquiries	: 30
No. of files	: 12
No. of external interfaces	: 5

सुगम स्टेशनरी सलायर्स एण्ड फोटोकॉपी सर्विस
बालकुमारी, ललितपुर ९८४७५९९५९२
NCIT College

Assume that the complexity adjustment values are average.

2. a) Discuss, with respect to a software project, the need for risk analysis and management and the steps involved in this activity. 7
- b) Why are software reviews important? What are the guidelines for conducting FTR? 8
3. a) What do you mean by version control? Explain the steps involved. Why is configuration audit essential during software development process? 8
- b) What do you mean by Analysis modeling? What is its importance? Explain the Elements of analysis model. 7
4. a) What is a software design? Why are design principles important in software design? Explain the design principles. 8
- b) Why is software testing an integral part of software development? Explain the significance of white box testing and black box testing during SDLC. 7

5. a) Discuss the importance of software architecture. What is Transform mapping? Explain each step involved in Transform mapping. 7
- b) Explain about the Boundary Value Analysis and Equivalence partitioning in software testing. 8
6. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects? 8
- b) How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design. 7
7. Write short notes on: (Any two) 2x5
- a) Cost of Quality
- b) Verification and Validation
- c) RMMM plan

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Course: Software Engineering Fundamentals

Semester: Fall

Year : 2016

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

*The figures in the margin indicate full marks.
Attempt all the questions.*

1. a) Can evolutional model be satisfactorily used for development of all types of project? Describe the phases of the prototyping model. 7
- b) With the given data for an online shopping site developed by ABC software developers, 8

Numbers of User Input	:	98
Numbers of User Output	:	51
Numbers of User Inquiries	:	47
Numbers of External Interfaces	:	32
Numbers of Logical Files	:	61

Assuming that the complexity of the given website development is average, compute the function point, if the productivity of the ABC S/W Developers is 35 FP/P-M, and their salary structure is Rs. 15000 per month on average, estimate total cost of the software.

2. a) Why is it necessary to do software project planning? What are the different types of software risks? Explain. 7
- b) What is SQA? Discuss the activities involved as a part of SQA plan. 8
3. a) "Quality and Reliability are related concepts but are fundamentally different". Justify this statement with a suitable example. 7
- b) What is software configuration management? Describe the change control process in brief. 8
4. a) Obtain a level-1 DFD and design data dictionary for any one data from the given scenario. 8

A travel agency arrange holidays for customer. Booking are made directly by customers. When a customer makes an approach, the

reservation clerk select appropriate flight detail & hotel detail from list which are regularly updated. The details are entered onto a provisional detail file. The customer must confirm this booking within 3 days by sending a deposit, reservation transfers the details from provisional booking file to confirm booking file. Four week before the flight is due, account send an invoice to the customer for the remaining costs. Accounts notify customer service when the full payment is received and customer services then send tickets and joining instructions to the customer.

5. b) "Requirement Analysis acts as the bridge between software Engineering and Software Design". Explain?
5. a) What is software design? Explain different elements of design model.
b) Explain basis path testing? Compute cyclomatic complexity from given piece of program.

```
large = x[0];
for (i=1, i<=n-1; i++)
{
    if (x[i]>large)
        large = x[i];
}
```

6. a) What do you mean by domain analysis? What are the different components of object oriented analysis model?

- b) What are Class, Object, Attributes and Methods? Explain with appropriate examples.

7. Write short notes on: (Any two)

- a) White Box Testing & Black Box Testing
- b) Data dictionary
- c) Transform Mapping versus Transaction Mapping

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2016

Programme: BE

Full Marks: 100

Course: Software Engineering Fundamentals

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) List out some characteristics of software. Compare and contrast Prototyping Model with Spiral Model giving a suitable example. 8
- b) Compute the function point value for a project with the following information domain characteristics. 7
 - Number of user input: 32
 - Number of user output: 60
 - Number of user inquiries: 24
 - Number of files: 8
 - Number of external interface: 2
- a) "If you do not actively attack the risk, the risk will attack you", Justify your statement. Differentiate between predictable and unpredictable risks. 7
- b) Explain software reliability? Explain the guidelines for conducting formal technical review (FTR). 8
- a) What do you mean by ISO standards for software? Explain format approaches to SQA (Software Quality Assurance). 7
- b) What is the role of a baseline and SCI's in SCM process? Explain SCM process with necessary diagram. 8
- a) Obtain a level 1 DFD and design data dictionary from any one data from the given scenario. Sajha Bus Company owns a number of buses. Each bus is allocated to a particular route, there are several buses for the same route. One or more drivers are allocated to each bus. Each route has one or more stations. One of the station is the garage where buses are kept and each bus is identified by the bus number and route. Drivers and conductors have an employee name, id, address and 8

- contact no.
- b) Define software prototyping and software specification review. Explain various elements of analysis model. 7
5. a) Explain the characteristics of object-oriented system with example. 7
 b) What do you mean by data design in software design process? Explain component level design. 8
6. a) Find the cyclomatic complexity $V(G)$ for the following code. 6
- ```

int a,b,c;
d=b*b -4*a*c;
if(d<0)
{
 real= -b/(2 *a);
 d = -d;
 num=pow(d,0.5);
 imag =num/(2*a);
}
else if(d==0)
{
 root1=-b/(2*a);
 root2=root1;
}
else if (d>0)
{
 root1=(-b+sqrt(d))/2*a;
 root2=(-b-sqrt(d))/2*a;
}

```
- b) Why do we need software testing? Explain Black box and Beta testing. 4
- c) What do you mean by domain analysis? What are the different components of object oriented analysis model? 5
7. Write short notes on: (Any two) 2x5
- a) Version Control & Change Control
- b) Integration Testing
- c) System Design Process

# POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester: Fall

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Is it mandatory to follow any software process model while developing software? Justify. What is the role of people in software? 7
- b) Compare Size Oriented Metrics and Function Oriented Metrics. A college MIS is to be developed in which the estimated lines of code is calculated to be 58.000 and a review of historical data reveals that the average productivity is 500(LOC/PM) and the labor rate is Rs.20000 per month. Calculate the estimated project cost and estimated effort for the given software? 8
2. a) "Adding People to a late software project makes it later". Identify the risk and develop a Risk Information Sheet. 8
- b) You have given the responsibility for improving the quality of software across your organization. What is the first thing that you should do? What's next? 7
3. a) Assume that you are the manager of a project. What baselines would you define for the project and how would you control them? 7
- b) What models are created during the analysis phase of a software development process? Explain in brief. 8
4. a) Do you design software when you write a program? What makes software design different from coding? 7
- b) Define the terms classes, inheritance and polymorphism. Describe the concept of information hiding with respect to software design in your own words. 8
5. a) Illustrate "Object Oriented Paradigm as a new concept in Software" with appropriate example. 7
- b) Define Cyclomatic Complexity. Using Basis path testing approach 8

**draw the Flow Graph and find out the Cyclomatic Complexity of the following piece of code.**

```
int a=1,b=1,n,c;
for(i=1;i<=n-2;i++)
{
 c=a+b;
 a=b;
 b=c;
 printf("%d",c);
}
```

6. a) Compare and Contrast Verification and Validation. Do both make use of test case design methods and testing strategies? 7
- b) "Don't rush through it! Design is worth the effort." Justify the statement with some design principle. 8
7. Write short notes on: (Any two) 2x5
- a) Cardinality and Modality
  - b) ISO Standard
  - c) Design Patterns

# POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester: Spring

Year : 2017

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What is a software engineering paradigm? Discuss the RAD model, stating its advantages and disadvantages. 8  
b) What are the disadvantages of LOC based Estimation. Explain the function Point Metric of Software Project Estimation. 7
2. a) Why risk analysis is done? Assume that software team defines a project risk in as follows:  
**Risk Identification:** Only 60 percent of the software components scheduled for reuse will, in fact, be integrated into the application. The remaining functionality will have to be custom developed.  
**Risk Probability:** 65% (likely)  
**Risk Impact:** 50 reusable software components were planned. If only 60 percent can be used, 10 components would have to be developed from scratch. The average component is 200 LOC and local data indicate that the software engineering cost for each LOC is \$20.00. Find risk exposure. 8  
b) Why are software reviews important? What are the guidelines for conducting FTR? 7
3. a) What is "configuration audit" and "status reporting"? How it aids in software configuration management? 7  
b) What do you mean by Analysis modeling? What is its importance? Explain the Elements of analysis model. 8
4. a) Define software design. Explain architectural and component level design. 8  
b) Explain the purpose of black box and white box testing. Why do we need validation testing? 7

5. a) Explain the use of data dictionary and purpose of SRS? 7  
b) Discuss validation and verification in testing. Explain Control flow structure testing. 8
6. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects? 7  
b) What do you understand by Domain Analysis? What are the different steps involved in it? 8
7. Write short notes on: (Any two) 2x5
- a) Design pattern  
b) Version control  
c) Cost of Quality

# POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester: Fall

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.  
Attempt all the questions.*

1. a) What are the common myths or misconceptions of customers regarding software engineering or development process? "Adding programmers and or project members to a late software project makes it later". Justify this statement. 4+3
- b) You are required to develop a Hotel Management System in which the estimated lines of codes (LOC) is calculated to be 85,000, and a review of the historical data reveals that the average productivity for this type of system is 200 LOC/pm and the labor rate is Rs. 7,500 per month. What would be the estimated project cost and the estimated effort for this software package? 8
2. a) Discuss about objectives, constraints, process and results of Formal Technical review. 8
- b) What are the different metrics used for different software life-cycle stages, respectively? Discuss. 7
3. a) What do you understand by OOA and OOD? Define Inheritance, encapsulation and polymorphism with relevant examples. 5
- b) What is Change control and Version control? Explain in detail. 10
4. a) What are various design principles? Describe data-centred and data – flow architecture models. 10
- b) Explain the concepts of modularity, cardinality, modality, using a suitable example. 5
5. a) In what cases you would like to conduct "Equivalence partitioning". Explain. Also list out the guidelines for conducting BVA, with examples for those guidelines. 8

- b) "Spiral Model is in agreement with the fact that technological evolution is inevitable upto infinity." Elucidate this statement. 7
6. a) What are the different stages of risk mitigation and planning? 7  
b) Explain the role of risk exposure in risk prioritization.
- b) Assume that you are a project manager. What will be your roles and responsibilities at every stage of project management to ensure timely and efficiently completion of the project? 8
7. Write short notes on: (Any two) 2×5
- a) COCOMO Model
  - b) Data dictionary
  - c) Boundary Value Analysis

# POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE

Course: Software Engineering Fundamental

Semester: Spring

Year : 2018  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define software metrics collection process. Explain each step in brief. 7  
b) Given data for a AI based social networking site developed by ABC company: 8

Number of user input : 96

Number of user output: 51

Number of user inquiries: 48

Number of External interfaces: 37

Number of logical files: 60

Assuming that the complexity of the given website development is average, compute the function point. If the productivity of the ABC software developers is 32 FP/PM and their salary structure is Rs 39000 per months on average, Estimate total cost of the software.

2. a) What is formal technical review? Describe the procedure of FTR. 8  
b) Explain the elements of the analysis model. 7
3. a) What do you mean by version control? Explain the importance of configuration audit and status reporting while configuration management. 8  
b) Define Cyclomatic Complexity. Using Basic path testing approach draw the flow graph and find the Cyclomatic Complexity for the following code. 7

```
int f1 (int x, int y){
```

```
 while (x!=y){
```

```
 if (x>y) then
```

```
 x=x-y;
```

```
else
y=y-x;
}
return x;
}
```

4. a) What is software architecture? Why is it important? Explain data centered architecture with necessary diagram. 8
- b) Prepare level 1 DFD for the following doctor appointment system. A potential patient joins the doctor by submitting a patient application form. A new patient record is created and stored in patient record store. A patient makes an appointment by providing their patient details. An appointment card is given to the patient after they have made the appointment. The appointment details are stored in the database. A receptionist makes a telephone appointment for a patient by entering their patient details. A receptionist also cancels appointment for a patient by entering their cancelation details. Both processes update the appointment section of the database. A doctor will see a patient. When they see a patient, a list of appointment and patients records will be sent to the doctor. A doctor may want to issue a prescription by entering prescription details into the system and a prescription is be issued to the patient. 7
5. a) Define verification and validation. Mention the reasons for conducting black box testing.
- b) What do you mean by domain analysis? Explain domain analysis process.
6. a) What do you mean by inheritance, encapsulation and polymorphism? Explain how objects interact with each other using messages.
- b) Differentiate between object oriented an analysis and object oriented design.
7. Write short notes on: (Any two)
- a) SCRUM process .
- b) Cost of quality
- c) Functional Independence

POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Software Engineering Fundamentals

Semester: Fall

Year : 2019  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the attributes of good software? Explain RAD model. 7  
b) Calculate the function point value for a project with the following information: 8
- Number of user input : 64  
Number of user output: 120  
Number of user inquiries: 48  
Number of External file:4  
Number of user files: 16  
Given that all complexity adjustment values are average.
2. a) Why it is necessary to estimate the project? Define software risk and explain how you manage them. 7  
b) Define Formal Technical Review. What are the steps of FTR? Explain how do you conduct FTR. 8
3. a) What do you mean by SQA? Explain Statistical quality assurance with example. 7  
b) What is software quality standard for a software? Explain the steps of ISO certification. 8
4. a) What is SCM? Explain the role of baseline and SCI in SCM process with necessary diagram. 8  
b) What is analysis modelling? How can requirement specification be helpful in software development process? Differentiate between data and functional modelling. 7
5. a) Explain software design process and principles. 8

- b) Define Test case. Differentiate white box testing and black box testing 7
6. a) What do you mean by domain analysis in OOAD? Different between 7  
OOA and OOD.
- b) Explain OOA process with the help of necessary diagram. 8
7. Write short notes on: (Any two) 2×5
- a) ISO quality Standards
  - b) Control Structure Testing
  - c) Design Patterns

**POKHARA UNIVERSITY**

Level: Bachelor  
Programme: BE  
Course: Software Engineering Fundamentals

Semester: Spring

Year : 2019  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.  
Attempt all the questions.*

1. a) You are required to develop a Hotel Management System in which the estimated lines of codes (LOC) is calculated to be 75000 and a review of the historical data reveals that the average productivity for this type of system is 244 LOC/PM and the labor rate is Rs 7,500 per month. What would be the estimated project cost and the estimated effort for this software package? 7
- b) What do you mean by reactive and proactive risk strategies? According to the risk table developed for a project, one of the risks is 'staff turnover will be high'. List the possible steps to mitigate this risk. 8
2. a) Define software quality assurance (SQA). Explain formal technical review with its importance in software development and list out the steps to conduct FTR. 8
- b) What do you mean by SCM? Explain the importance of configuration audit and status reporting in SCM. 7
3. a) What are the elements of analysis model? Explain each element in brief. 7
- b) What do you mean by design model? List any six design principles. Explain Data-flow architecture. 8
4. a) Design a Level 1 DFD for a Food Ordering System. Include following requirements in your design. 8
  - Customer can place an Order. The Order Food process receives the Order, forwards it to the Kitchen, store it in the Order data store, and store the updated Inventory details in the Inventory data store. The process also deliver a Bill to the Customer.
  - Manager can receive Reports through the Generate Reports process, which takes Inventory details and Orders as input from the Inventory and Order data store respectively.

- Manager can also initiate the Order Inventory process by providing Inventory order. The process forwards the Inventory order to the Supplier and stores the updated Inventory details in the Inventory data store
- b) What do you mean by software testing? List out the objective of testing. Explain software testing strategies with examples. 7
5. a) What are the importance of validation testing? Define cyclomatic complexity. Draw flow graph and find the cyclomatic complexity of the following code: 8

```

Int fun(int x, int y){
 while(x!=y){
 if(x>y)
 x=x-y;
 else
 y=y-x;
 }
 return x;
}

```

- b) What do you mean by Encapsulation? What are the steps involved in identifying the elements of an Object model? 7
6. a) Differentiate between object oriented analysis and object oriented design. Explain the importance of domain analysis in OOAD. 8
- b) What do you mean by design patterns? Explain the importance of object oriented analysis and design in software development. 7
7. Write short notes on: (Any two) 2×5
- Software process and process models
  - Statistical Quality Assurance
  - Functional Modeling and behavioural modeling