KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
CSE 3201
Operating Systems

TIME: 1.5 hours FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) Define deadlock. Explain the purpose of 'wait for graph'. How it can be constructed from 'Resource-Allocation graph'. (11)
   b) Depict how a boot-sector computer virus affects an operating system (OS). (11)
   c) Explain how access matrix can be implemented? (08)

2. a) Depict the paging model of logical and physical memory. Explain it using a 32 byte memory with 4 byte pages. (11)
   b) Explain (i) First fit, (ii) Best fit, and (iii) worst fit storage allocation algorithms. (11)
   c) How a failure is detected in distributed environment? Explain. (08)

3. a) What is distributed file system? Discuss about its structure. (11)
   b) How repeated collisions over a communication network can be avoided? Explain. (11)
   c) Using your own data, explain RSA algorithm. (08)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) What is the purpose of loadable kernel modules? List three services provided by an operating system, and explain how each creates convenience for users. In which cases, would it be impossible for user-level programs to provide these services? Explain your answer. (10)
   b) Some computer systems provide multiple register sets. Describe what happens during the following scenarios: (10)
      i) When a context switch occurs if the new context is already loaded into one of the register sets.
      ii) When the new context is in memory rather than in a register set and all the register sets are in use.
   c) Using Amdahl's Law, calculate the speed gain for the following applications: (10)
      i) 50% parallel with eight processing cores.
      ii) 70% parallel with four processing cores.
      iii) 90% parallel with eight processing cores.

5. a) The following processes are being scheduled using a preemptive, round-robin scheduling algorithm. (20)

Process	Priority	Burst	Arrival
P_1	4	25	0
P_2	3	30	30
P_3	3	20	30
P_4	2	20	50
P_5	5	15	70

Each process is assigned a numerical priority, with a higher number indicating a lower relative priority. In addition to the process listed above, the system also has an idle task (which consumes no CPU resources and is identified as P_{idle}). This task has priority 100 and is scheduled whenever the system has no other available process to run. The length of a time quantum is 10 units. If a process is preempted by higher priority process, the preempted process is placed at the end of the queue.

i) Show the scheduling order of the processes using Grantt chart.
ii) What is the average turn around time?
iii) What is the average waiting time?

b) In Dining-Philosophers problem, discuss solutions behind the following outcomes: (10)
   i) Deadlock
   ii) Starvation
   iii) No deadlock with maximum parallelism.

6. a) Consider the following page reference string: (20)
   7, 2, 3, 1, 2, 5, 5, 7, 1, 0, 1, 3, 1, 5, 4, 6, 2, 3, 0, 1
   Assuming demand paging with four frames, how many page faults would occur for the following replacement algorithms?
   i) LRU replacement.
   ii) FIFO replacement.
   iii) Optimal replacement.

   b) We have contiguous allocation scheme and linked list allocation schemes for implementing files. Compare the two schemes based on their relative advantages and disadvantages. (10)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
CSE 3207
Applied Statistics and Queueing Theory

TIME: 1.5 hours FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Necessary table: Areas under Normal Curve, t Table are attached at the end of the questions.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) A congested computer network has a 1% chance of losing a data packet, and packet losses are independent. An email message requires 100 packets. If there are 10 email messages, what is the probability that at least one message requires that two or more packets be re-sent? (13)

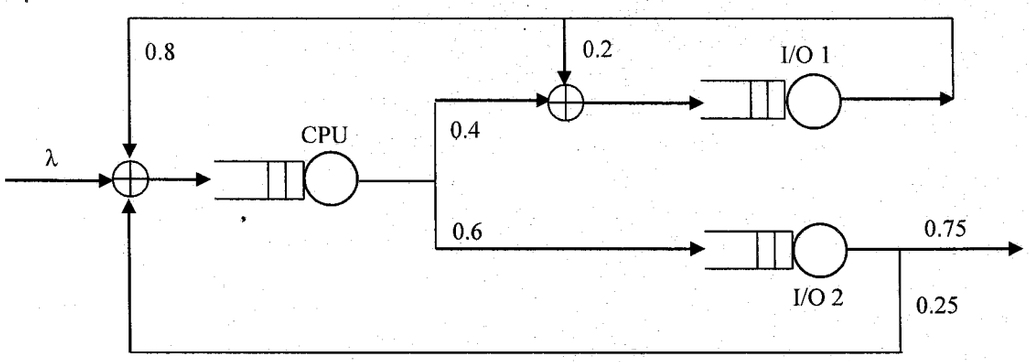
b) For an M/M/s queueing system, show that the expected waiting time in the queue for customers who must wait is $1/(s\mu - \lambda)$, symbols have their usual meanings. (17)

2. a) An amateur gardener with training in botany is experimenting with scientific cross pollinations of pink irises with red, orange, and white irises. His annual experiments show that pink can produce 60% pink and 40% white, red can produce 40% red, 50% pink, and 10% orange, orange can produce 25% orange, 50% pink, and 25% white, and white can produce 50% pink and 50% white. (17)

i) If the gardener started with equal number of each type iris, what would the distribution be in the long run?

ii) How many years on the average would a red iris take to produce a white bloom?

b) Figure below shows a queueing model of a multiprogramming computer system with a CPU and two I/O units. Jobs arrive to CPU according to a Poisson process with rate λ. Figure shows the transition probability of jobs from one unit to another. Jobs are executed in each station with exponential service time. Calculate the mean sojourn time of the system if $\mu_{cpu} = 8\lambda$, $\mu_{I/O1} = \mu_{I/O2} = 4\lambda$. (13)

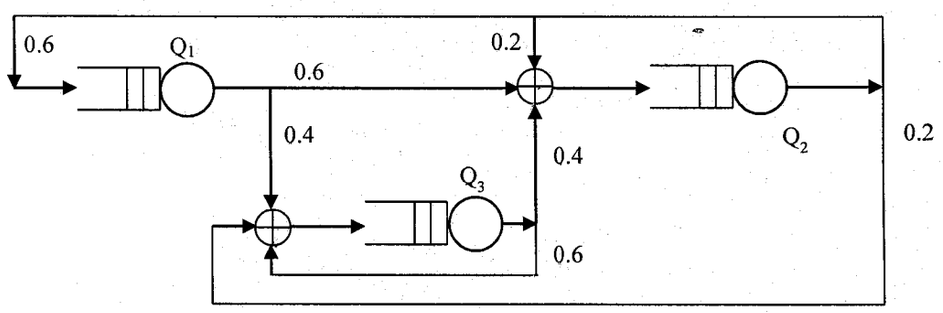


3. a) Consider the closed queueing network of single server queues with exponentially distributed service times, as shown in the figure below. The average service rates of Q_1, Q_2, and Q_3 are respectively, $\mu_1 = 0.5$, $\mu_2 = 1$, and $\mu_3 = 0.5$. If the system has a total user population of 4, calculate the followings using Buzen's algorithm. (24)

i) The state probability distribution of the network.

ii) The actual throughput of each queue.

iii) The average waiting time of each queue.



b) State Jackson's theorem of open queueing network. (06)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) A startup company from KUET recently designed a new processor and they claimed that their processors are better than regular processors. To verify their claim, a team from KUET consists of seven CSE professors ran six different programs on both processors and recorded their respective execution time which can be found in the table below. Using the information in the table, decide whether there is any significant performance difference between the two processors? (10)

	Program 1	Program 2	Program 3	Program 4	Program 5	Program 6
Processor (Regular)	100s	86s	115s	150s	48s	190s
Processor (KUET)	92s	80s	111s	148s	48s	192s

b) The systolic blood-pressure threshold for hypertension treatment is 140 mm Hg for all adults. We surveyed 157 Bangladeshi people and found that the mean systolic blood pressure was 146 mm Hg with a standard deviation of 27. On the basis of the above information, decide whether the mean systolic blood pressure of Bangladeshi people is greater than the standard threshold of 140 mm Hg using a 99% confidence level? (10)

c) In the actual world, which form of hypothesis testing error (Type I, Type II) is the most dangerous and why? (10)

5. a) Due to Covid-19, the KUET campus is shut down for a very long time. Therefore, the KUET administration has finally decided to admit talented students through expert recruiters. The recruiters usually take several viva online to select the top freshman students. What would be the number of admitted students if the administration decided to spend Tk. 1.5 lakhs for recruiters, based on the following data collected from the university? (Use 0.8 as the coefficient of correlation.) (10)

	Expenditure on Recruiters (in Tk. lakhs)	No. of Admitted Students
Mean	20	90
Standard Deviation	05	12

b) After giving a bad class test, Pranto is requesting the assigned faculty of statistics from CSE dept. for some extra points. Instead of providing free points, the faculty suggests a game where Pranto will toss two coins into the air simultaneously and will earn one point for each number of heads. However, he will lose five points if either of the coins fails to produce a single head. Calculate the expected value of the proposed game and determine whether or not Pranto should play the game? (10)

c) Is there any difference between coefficient of determination and coefficient of correlation? Or are they indicating the same thing? Justify your answer. (10)

6. a) Define prediction interval with example. (05)

b) The mark distribution of 120 students of the course 'CSE 3207' has a mean of 70 and a standard deviation of 15. If a sample of 25 students are selected randomly then (13)

i) What is the probability that the sample mean is between 65 and 72?

ii) Estimate the value that is two standard deviation above the expected value, 70, of the sample mean.

c) Which correlation coefficient is preferable when the data you are using is continuous and follows a monotonic relationship? Justify your answer. (12)

Note: All examples and data used in the questions are imaginary and does not represent any real entity.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
CSE 3211
Compiler Design

TIME: 1.5 hours FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) "Compiler is a translator program" – Why? Translate the statement $P = i + r * 60\%$ into different phases. (12)
   b) Write a program in flex to detect a floating point number. (08)
   c) Eliminate left recursion from the following grammar: (10)

$$S \rightarrow Aa \mid b$$
$$A \rightarrow Ac \mid Sd \mid \varepsilon$$

2. a) Explain the meaning of LL(K) parsing. Consider the following grammar: (20)

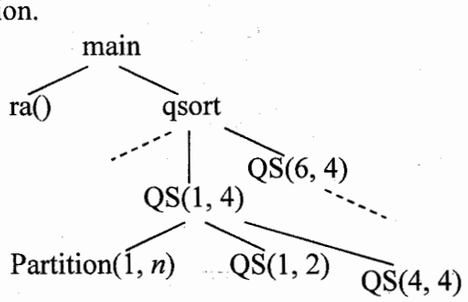
$$S \rightarrow aBu$$
$$B \rightarrow bB \mid \varepsilon$$

   Show the parser table, stack, input, output using LL(1) for the input string *abbu*.
   b) What are the conflicts of shift reduce parsing? (05)
   c) Define Left-factoring with example. (05)

3. a) Consider the following code segment: (20)

```
i = p * n + k;
while (i>0) do
    i = i - k;
```

   i) Generate the three address code.
   ii) Implement the three address code by quadruples and triples.
   b) Show the stack content for the following tree when (10)
   i) Partition(1, *n*) is in execution.
   ii) QS(4, 4) is in execution.



SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) Differentiate between one pass and multi pass compiler. (07)
   b) Write a CFG with semantic rules to derive the following input string: (15)

"*Array* [1. . . 25] *of double*"

   Draw an Annotated Parse Tree for this input.
   c) Determine the ambiguity of the following grammar: (08)

$$string \rightarrow string + string \mid string - string \mid 0 \mid 1 \mid \ldots\ldots \mid 9$$

   If you found it ambiguous, construct a new non ambiguous grammar.

5. a) Consider a target machine is two byte addressable. Starting address of stack is 290. Starting address of activation record is 50. Each action costs 20 bytes. ssize, psize and qsize are 10, 20 and 30 bytes, respectively. Now determine the memory locations for the following code segment: (2

```
/* code for s */        /* code for p */        /* code for q */
action 1               action 3               action 4
call p                 return                 call s
action 2                                      action 5
halt                                          call q
                                              return
```

b) Define Type Expressions for the following code: (10)

```
struct student
{
    char Name[20];
    int Roll;
    double CGPA;
}STUD[120];
```

6. a) Consider the following three address code. Apply peephole optimizations showing flow graphs for each optimization. (15)

```
1.  i = m-1                 8.  if t3<v goto (5)
2.  j = n                   9.  j = j-1
3.  t1 = 3*n                10. t4 = 4*j
4.  v = a[t1]               11. t5 = a[t4]
5.  i = j+1                 12. if t5>v goto (9)
6.  t2 = 3*i                13. t6 = 4*i
7.  t3 = a[t2]              14  a[t6] = x
```

b) Draw a Directed Acyclic Graph (DAG) for the following expression: (10)

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

c) Define static checking with examples. (05)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
CSE 3217
Mobile Computing

TIME: 1.5 hours FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) Define Mobile Computing and give examples(s) (05)
   b) Explain the Mobile Computing Architectural layers clearly. (12)
   c) What are the current challenges of Mobile Computing? Explain how to cope with these challenges. (13)

2. a) "A smartphone act as a bunch of sensors" – Justify the statement. (08)
   b) What are ARM Processors? Classify different ARM processors and explain the general register set of it. (15)
   c) What is the significance of UI and UX design for a Mobile device? (07)

3. a) What is Mobile-cloud computing? Explain Mobile-cloud computing structure clearly. (10)
   b) Draw the Android architectural layers and explain the function of each layers. (12)
   c) "Resources are scarce in mobile platform" – Justify the statement. (08)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) What is Ubiquitous computing? What are the goals of pervasive computing? (10)
   b) What is the significance of Ad-hoc networks over Infrastructure based networks? Discuss briefly. (10)
   c) What is meant by "unfairness" in WSN? How MACAW solve unfairness of a wireless network. (10)

5. a) Briefly discuss the working principle of MARR-ALOHA in VANET. How does CAH-MAC overcome the problem in RR-ALOHA? (10)
   b) Define Zigbee stack. Briefly describe the layers of the zigbee stack. (10)
   c) Why does CSMA/CD fail in wireless networks? (10)

6. a) What is NGN? Draw the architecture of NGN and write a short note on it. (10)
   b) Define Zigbee protocol. Why should we choose Zigbee over Bluetooth and Wi-fi. (10)
   c) Briefly discuss the working principle of RR-ALOHA in VANET. How does RR-ALOHA+ overcome the problem in RR-ALOHA. (10)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
HUM 3227
Professional Ethics and Moral Thoughts

TIME: 1.5 hours FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) What do you mean by "Egoism". (10)
   b) Why we shouldn't be Egoistic? Discuss its effect on our society. (20)

2. a) Find out the relationship between Ethics and other branches of knowledge. (20)
   b) What is "Utilitarianism"? (10)

3. a) Discuss the necessity of the code of Ethics. (10)
   b) Write down some fundamental code of ethics of IEEE. (20)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) What is moral sentiment? (10)
   b) What are the bases of human behavior? Explain. (20)

5. a) What is organizational commitment? (10)
   b) Discuss the types of organizational commitment. (20)

6. a) "All moral values are relative" – comment on it. (15)
   b) Discuss about moral dilemma. (15)