Total No. of Pages: 4 | *Roll No.* MC/53

5th SEMESTER | **B. Tech. (MC)**

END SEMESTER EXAMINATION | **(NOVEMBER-2018)**

MC 301: Operating System

Time: 3:00 Hours **Max. Marks: 40**

Note: Answer any five questions. Use of calculator is permitted. Assume suitable missing data, if any.

Q1. a) Describe various functions of operating system. **(6)**

b) Differentiate between preemptive and non-preemptive scheduling algorithm each with an example. **(2)**

Q2. a) For the processes listed in the table:

Process	Arrival Time	CPU Burst Time
A	0.000	3
B	1.001	6
C	4.001	4
D	6.001	2

Draw a chart illustrating their execution using the algorithms mentioned below and also find out the average turnaround time (rounding to the nearest hundredth) and average waiting time (rounding to the nearest hundredth) in each case. **(4)**

i) Shortest Job First

ii) Shortest Remaining Time

b) From the process resource usage and availability given below draw the Resource Allocation Graph and by using it check whether the system is Deadlocked or not?

PTO

Process	Current Allocation			Outstanding Requests			Resources Available		
	R_1	R_2	R_3	R_1	R_2	R_3	R_1	R_2	R_3
P_1	2	0	0	1	0	0	0	2	0
P_2	1	2	0	0	0	1			
P_3	0	1	1	0	0	0			
P_4	0	0	1	0	0	1			

(4)

Q3. a) Consider the following snapshot of a system.

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	2	1	0	0
P_1	2	0	0	0	2	7	5	0				
P_2	0	0	3	4	6	6	5	6				
P_3	2	3	5	4	4	3	5	6				
P_4	0	3	3	2	0	6	5	2				

Using Banker's algorithm answer the following questions (6)

i) Calculate the need matrix?

ii) How many total number of resources of type A, B, C and D are there?

iii) Is the system in safe state? Why?

iv) If a request from process P_2 arrives for (0, 1, 0, 0), can it be granted safely?

b) Describe very briefly the various process schedulers. (2)

Q4. a) Assume the amount of memory on a system is inversely proportional to the page fault rate. Each time memory doubles, the page fault rate is reduced to half. Currently the system has 32Mb of memory. The page fault rate is 2%. When a page fault does not happen the access time is 500 ns. Overall, the effective access time is $300\mu s$. If memory was increased to 128Mb, what would be the overall access time? (4)

check

b) On a simple paging system with a page table containing 512 entries of 16 bits each, and a page size of 1024 bytes, (1*4=4)

i) How many bits in the logical address specify the page number?

ii) How many bits in the logical address specify the offset within the page?

iii) How many bits are in a logical address?

iv) How many bits are in a physical address?

Q5. a) What is File System in operating systems? Discuss its various types, file attributes and file operations. (4)

b) In this problem, use binary values, a page size of 2^7 bytes, and the following page table.

In/Out	Frame
In	00101
In	01011
Out	00001
In	11010
Out	00011
Out	10101
Out	11111
In	10101
....	....

Which of the following virtual addresses would generate a page fault? For those that do not generate a page fault, to what physical address would they translate? (4)

a) 0000001001001

b) 0000011010110

c) 0000100000101

d) 0001110111100

PTO

Q6. a) On a disk with 1000 cylinders, numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests 222, 123, 874, 468, 692, 768 in the disk queue. Assume the last request serviced was at track 345 and head is moving towards the track 999. Perform the computation by using:

i) FCFS
ii) SSTF
iii) C-SCAN
iv) C-LOOK **(4)**

b) On a system using variable partition memory allocation, assume memory is allocated as specified in the diagram given below, before additional requests for 15K, 20K and 20K (in that order are received). At what starting address will each of the additional requests be allocated by using Best fit and Worst fit algorithm. Which algorithm makes the most efficient use of memory? **(4)**

Used	Hole	Used	Hole	Used	Hole	Used	Hole	Used	Hole	Used	Hole
10K	20K	30K	15K	10K	30K	20K	40K	10K	35K	20K	25K

Q7. Write a short note on any four of the following: **(2*4=8)**

i) Logical vs physical address space
ii) Deadlock prevention
iii) User and system viewpoint of operating system
iv) Spooling
v) Difference between paging and segmentation.

- END -

Total No. of Pages 2 **ROLL NO...MC/53**

FIFTH SEMESTER **B.Tech. Mathematics & Computing**

END SEMESTER EXAMINATION, ***Nov/Dec-2018***

Code & Title: MC 303 Stochastic Processes

Time: 3:00 Hours ***Max. Marks : 40***

Note : Answer all question by selecting any two parts from each questions. All questions carry equal marks. Assume suitable missing data, if any.

1[a] Define stochastic process by giving a suitable example. Classify based on the state and the parameter of a stochastic process. Give an example of each class and their graphical representations.

[b] Babies are born in a city at the rate of one birth every 5 minutes. In case the inter arrival time follows exponential distribution then find the expected number of births per week and the probability of exactly ten births in a specific hour.

[c] Describe birth and death process, and as a special case derive transient solution for pure death process from this.

2[a] Show that in case of a random walk with two absorbing barriers the probability of ultimate absorption is one.

[b] In case of an unrestricted simple random walk find an expression for the probability that after n jumps the particle will be found between two specified limits. Apply this using specific value of the parameters.

[c] Design a specific simple random walk with two reflecting barriers. Find its steady state solution. Modify the model designed with one reflecting barrier and one absorbing barrier?

3[a] What is a Poisson process? Give example. In case of a Poisson process with rate λ find the inter arrival time distribution of the successive outcomes. Is Poisson process stationary process? Justify.

[b] In context with the states of a Markov chain define the relation '*communication*'. Show that it is an equivalence relation. Give examples of two finite state Markov chains, one with a single equivalence class, and second, with more than one equivalence class.

[c] A particle performs a random walk with absorbing barriers at 0 and 4. The probability for a positive jump is ½, the probability for a negative jump is 1/3, and the probability for the no jump is 1/6. Starting from 2, find the probability that the particle gets absorbed by the 4th step.

4[a] In case of a renewal process derive expression for the distribution function for the time until the nth renewal in the case $f(t) = ae^{-at}$. Using the expression derived find the distribution of the number of renewals in an interval of length t.

[b] Define transient and recurrent states. Show that a state i is transient or recurrent if, $\sum_0^{\infty} p_{ii}^{(n)}$ <= ∞. Verify this by considering a suitable example.

[c] Describe M/M/1 queuing model. Find the distribution of the time spent in the system and hence find the mean waiting time in the system and mean number in the system.

5[a] Describe M/M/c queue model. Find its steady state solution. Derive the probability of having to wait.

[b] In case of M/M/c/c model derive Erlang's loss formula. Find the probability of customer loss by taking specific value of the parameters.

[c] Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between the two arrivals. The length of the phone call is assumed to be distributed exponentially with mean of 3 minutes. What is the probability that an arriving person will have to wait? In case waiting time upto 3 minutes is fine, then by how much should the flow of arrivals increase in order to justify a second booth ?

-END-

Total No. of Pages: 04 Roll No.:..MC/53..

End Semester Examination November 2018

Subject Code: MC-305 Course Title: Operations Research

Fifth Semester B.Tech

Time: Three Hours Max. Marks: 40

Answer any five questions. (Assume suitable missing data, if any.)

1. Wild West produces two types of cowboy hats. A Type 1 hat requires twice as much labor time as a Type 2. If all the available labor time is dedicated to Type 2 alone, the company can produce a total of 400 Type 2 hats a day. The respective market limits for the two types are 150 and 200 hats per day. The revenue is \$8 per Type 1 hat and \$5 per Type 2 hat.

(a) Formulate LPP and use the graphical solution to determine the number of hats of each type that maximizes revenue.

(b) Determine the dual price of the production capacity (in terms of the Type 2 hat) and the range for which it is applicable.

(c) If the daily demand limit on the Type 1 hat is decreased to 120, use the dual price to determine the corresponding effect on the optimal revenue.

(d) What is the dual price of the market share of the Type 2 hat? By how much can the market share be increased while yielding the computed worth per unit? 8

2.

a. Write the dual problem corresponding to following primal LPP model.

$$\text{Minimize } z = -2x_1 + 3x_2 + 5x_3$$

Subject to

$$-2x_1 + x_2 + 3x_3 + x_4 \geq 5$$

$$2x_1 + x_3 \leq 4$$

$$2x_2 + x_3 + x_4 = 6$$

$$x_1 \leq 0$$

$$x_2, x_3 \geq 0$$

$$x_4 \text{ unrestricted in sign}$$

b. Consider the following ILP formulation

$$\text{Maximize } z = 7x_1 + 10x_2$$

Subject to
$$-x_1 + 3x_2 \leq 6$$
$$7x_1 + x_2 \leq 35$$
$$x_1, x_2 \geq 0 \text{ and integer}$$

Given the slacks x_3 and x_4 for above constraints respectively, the optimum LP tableau is given as

Basic	x_1	x_2	x_3	x_4	Solution
z	0	0	63/22	31/22	133/2
x_2	0	1	7/22	1/22	7/2
x_1	1	0	-1/22	3/22	9/2

List all possible cuts for the Table. Find out the optimal solution using cutting plane method. 3 + 5

3. Five workers are available to perform four jobs. The time (in hours) which it takes each worker to perform each job is:

	Job 1	Job 2	Job 3	Job 4
Worker #1	10	15	10	15
Worker #2	12	8	20	16
Worker #3	12	9	12	18
Worker #4	6	12	15	18
Worker #5	16	12	8	12

The goal is to assign workers to jobs so as to minimize the total time required to perform the four jobs. Formulate the LP model for the problem. Give the solution of the same with interpretation. 8

4.

a. Describe the transportation problem and give the general LPP formulation with N sources and M demand locations with supply a_i, demand b_j and C_{ij} cost from i^{th} source to j^{th} demand location.

Check

per unit.

b. In a 3×3 transportation problem, let x_{ij} be the amount shipped from source i to destination j and let C_{ij} be the corresponding transportation cost per unit. The amounts of supply at sources 1, 2, and 3 are 15, 30, and 85 units, respectively, and the demands at destinations 1, 2, and 3 are 20, 30, and 80 units, respectively. Assume that the starting northwest-corner solution is optimal and that the associated values of the multipliers are given as $u_1 = -2, u_2 = 3, u_3 = 5, v_1 = 2, v_2 = 5, and\ v_3 = 10$.

(i) Find the associated optimal cost.

(ii) Determine the smallest value of C_{ij} for each non basic variable that will maintain the optimality of the northwest-corner solution.

3 + 5

5.

a. Write short note on TSP problem with LP model.

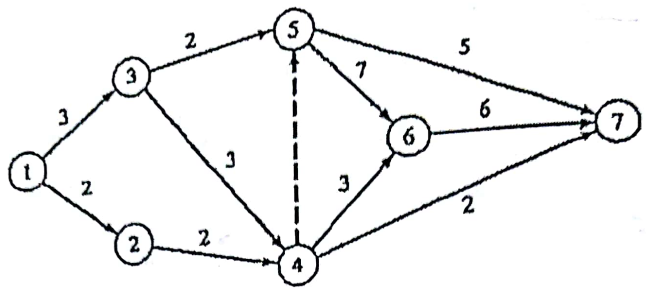
b. Discuss about the Least-cost Method for finding out the initial basic feasible solution for transportation problem and apply it on following transportation problem.

	1	2	3	Supply
1	\$5	\$1	\$7	10
2	\$6	\$4	\$6	80
3	\$3	\$2	\$5	15
Demand	75	20	50	

c. Describe critical and non-critical activities, Schedule conflict and Red-Flagging rule.

2 + 3 + 3

6. Determine the critical path for the project network given in following Figure. Identify the red flagged activities, if any. Give your comments on the schedule of different activities in the project network.



8

ALL THE BEST

Roll No. MC/53

FIFTH SEMESTER

B.Tech.[Elective]

END SEMESTER EXAMINATION

Nov., 2018

MC307, Object Oriented Programming

Time: 3.0 Hours

M.M.: 50

Note: *Attempt **ANY** two parts from each questions. All questions carry equal marks. Assume suitable missing data, if any. Write your answers in sequence and concisely.*

1. (a) Write a computer program which demonstrate how friend functions work as a bridge between two classes.

   (b) Distinguish between the following two statements:
   Time T2(T1);
   Time T2=T1;
   T1 and T2 are objects of time class.

   (c) What is dynamic initialization? Where it can be useful?

2. (a) What are the advantages of new and delete operators over malloc() and free() functions.

   (b) What is constructor overloading ? Explain with the help of computer program.

   (c) Write a computer program which shows how a template function is defined and implemented.

3. (a) Write a C++ program using class to create students data for the alumni office of DTU.

   (b) Write a computer program on the implementation of static member function.

   (c) When do we declare a class static? What are the characteristics of static members of a class?

4. (a) List the operators that cannot be overloaded and give reason be overloaded.

(b) Write a program to declare a class employee, consisting of data members emp_no, and emp_name. Write the member functions accept() to accept and display() to display the data for 5 employees.

(c) Create a class complex to represent complex number with overloaded addition and multiplication operators. Use them in a main program.

5. (a) Define different types of inheritance and write syntax for each type.

(b) Write a C++ program: first to enter a $(n \times n)$ matrix and then to find its inverse.

(c) Define pure virtual function? Explain with an example.

Total No. of Pages 2 Roll No. MC/53

FIFTH SEMESTER B.Tech.

END SEMESTER EXAMINATION (Nov –Dec 2018)

HU-351- MATHEMATICAL ECONOMICS AND ECONOMETRICS

Time: 3 Hour Max. Marks: 50

Note: Answer any five questions. Assume suitable missing data, if any.

1.a. Explain how the basic tools and techniques of Econometrics may be applied for Business Decision Making. 5

1.b.i To control a certain crop disease, it is necessary to use 8 units of chemical A, 14 units of Chemical B and 13 units of Chemical C. One barrel of spray P contains one unit of A, 2 units of B and 3 units of C. One barrel of spray Q contains 2 units of A, 3 units of B and 2 units of C. One barrel of spray R contains one unit of A, 2 units B and 2 units of C. Find by matrix method how many barrels of each type of spray be used to just meet the requirements. 2.5x2=5

1.b.ii Three products X, Y, Z are produced after being processed through three departments D1, D2, and D3. Following data are available.

check

Products	Hours required for a unit produced		
	In D1	In D2	In D3
X	2	5	1
Y	1	2	3
Z	2	2	3
	1100	1800	1400

Maximum Time available in Hours 1100, 1800 and 1400. Find by Matrix method, the number of units produced for each product to have full utilisation of the capacity.

2.a. Discuss relation between avarage and marginal cost curves 5

i. when AC is declimimg

ii. When AC is minimum

iii. When AC is rising

2.b.i If R= -A/B.(y+b)/(x+a) is the Marginal Rate of Substitution of y for x, show that one form of individual's utility function is $u=(x+a)^A (y+b)^B$ where a, b, A and B are constants. 2.5x2=5

2.b.ii Obtain the demand function for which Price Elasticity of Demand is one.

3.a Discuss the Chow Test in Testing for structural or Parametric stability of Regression Models.

3.b The production function for a commodity is 2.5x 2=5

$Q = 10L - 0.1L^2 + 15K - 0.2K^2 + 2KL$

(i) Calculate the marginal products of two inputs when 10units of each of labour and capital are used.

(ii) If 10 units of capital are used, what is the upper limit for use of labour which a rational producer will never exceed.

4.a Discuss significance of the Gauss-Markov Theorem in Econometrics. 5

4.b The demand and supply law for commodity are $P = 18 - 2x - x^2$ and $P = 2x - 3$ respectively. Calculate consumer surplus and producer surplus. 5

5.a. Differentiate between following: 2.5x 2=5

i. Primary Data and Secondary Data

ii. Nominal Variables and Ratio Variables

5.b A company has determined that the marginal cost function for a product of a particular commodity is given by $MC = 125 + 10x - x^2/9$ Where TC rupees is the cost of producing x units of the commodity. If the fixed cost is Rs. 250, what is the cost of producing 15 units. 2.5x 2=5

Graph

5.b.ii If the marginal revenue function for output x is given by $MR = [6/(x+2)^2] + 5$, find the total revenue function and demand equation.

6.a Discuss Stochastic Variables in Econometrics. 5

6.b.i The marginal propensity to consume out of income for the economy as a whole is given as 4/5. It is known that when income is zero, consumption equals Rs. 12 billion. Find the function relating to aggregate consumption to national income. Find aggregate saving as function of income. $C = \alpha + \beta Y$ 2.5x 2=5

Graph

6.b.ii If MPC= 2/5, find the consumption function, given the consumption is 100, when income is zero.

7. Write note on any two of the following 10

a. Significance of Econometrics for engineers

b. Dummy Variables

c. Monte Carlo Experiments

Total No of Pages 01
1st SEMESTER
END SEMESTER EXAMINATION

Roll. No. MC/5.3
B.TECH
Nov./Dec. 2018

HU-301 TECHNICAL COMMUNICATION

Time: 3.00 Hours

Max. Marks: 50

Note: Answer all the questions
Assume suitable missing data, if any.

1. Give synonyms for the following words: 5
   Pallid, indolence, jejune, propitious, heretic

2. Write short notes on any three of the following: 15
   a) Nonverbal communication
   b) Barriers to communication
   c) Listening skills
   d) Type of reports

3. Write a resume for an engineer applying for a job in an MNC (imagine details). 10

4. Describe communication boosters for making an effective presentation 10

5. Discuss GD as a tool for assessment during placement session. 10

-END-

Roll No................

Total No. of Pages: 2

B. Tech.

5^{th} SEMESTER

(NOVEMBER-2018)

END SEMESTER EXAMINATION

MC 315: Modern Algebra

Time: 3:00 Hours **Max. Marks: 50**

Note: All questions are compulsory. Attempt any two parts from each question. Assume suitable missing data, if any.

Q1.a) Let $G=\{(a,b): a\neq 0, b\in R\}$ and $*$ be a binary operation defined by $(a,b)*(c,d)=(ac, bc+d)$. Show that $(G,*)$ is a non-abelian group.

b) Show that subgroup of a cyclic group is cyclic.

c) Find out all the right cosets of H and K in G, where $G=<a>$ is a cyclic group of order 10 and $H=<a^2>$, $K=<a^5>$.

Q2.a) Give an example of three groups $E\subset F\subset G$, where E is normal in F, F is normal in G, but E is not normal in G.

b) If G is an Abelian group and N is a normal subgroup of G, then show that G/N is Abelian. Also show by an example that the converse need not be true.

c) Let G be any group and g be a fixed element in G. Define

$$\phi: G\to G \text{ by } \phi(x)=gxg^{-1}$$

Prove that ϕ is an isomorphism of G onto G.

Q3.a) If $\{R,+,.\}$ be a ring with identity, show that $\{R,\oplus,\otimes\}$ is also a ring with identity element, where $a\oplus b=a+b+1$ and $a\otimes b=a.b+a+b$, $\forall\, a,b\in R$.

PTO

b) Show by an example that sum of two subrings of ring may not be a subring.

c) Let R be a non-zero ring such that $x^2 = x, \forall x \in R$. Prove that R is a commutative ring of characteristic 2.

Q4.a) Show that in the ring $R = \left\{ \begin{pmatrix} a & b \\ 0 & 0 \end{pmatrix} : a, b \in Q \right\}$, the set

$M = \left\{ \begin{pmatrix} 0 & b \\ 0 & 0 \end{pmatrix} : a, b \in Q \right\}$ is a maximal ideal of R.

b) Show that intersection of two prime ideals of a ring R may not be a prime ideal of R.

c) Show that $Z\left[\sqrt{2}\right] = \left\{ m + n\sqrt{2} : m, n \in Z \right\}$ is a Euclidean domain.

Q5.a) Give an example of a division ring which is not a field.

b) If possible find gcd and lcm of $10+11i$ and $8+11i$ in $Z[i]$.

c) Prove that $Z\left[\sqrt{-5}\right]$ is not a U.F.D.

- END -

2.