

Code No: 133BD

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

MATHEMATICS – IV

(Common to CE, EEE, ME, ECE, CSE, EIE, IT MCT, ETM-MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 Hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A**

(25 Marks)

- 1.a) State the necessary and sufficient conditions for a function  $f(z) = u + iv$  to be analytic. [2]
- b) Show that  $f(z) = |z|^2$  is not analytic at any point. [3]
- c) State Cauchy's integral theorem. [2]
- d) Find the poles and the residues at the poles of the function  $f(z) = \frac{e^z}{\cos \pi z}$ . [3]
- e) Define bilinear transformation and cross ratio. [2]
- f) Find the image of the circle  $|z| = 2$ , under the transformation  $w = z + 3 + 2i$ . [3]
- g) State Fourier integral theorem. [2]
- h) Expand  $f(x) = \pi x - x^2$  in a half range sine series in  $(0, \pi)$ . [3]
- i) Classify the partial differential equation  $u_{xx} + 6u_{xy} + 2u_{yy} + 2u_x - 2u_y + u = x^2y$ . [2]
- j) Write the three possible solutions of the heat equation. [2]  
 $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$  [3]

**PART-B**

(50 Marks)

- 2.a) If  $f(z)$  is a regular function of  $z$ , prove that  
$$\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4 |f'(z)|^2$$
  - b) Let  $f(z) = u(r, \theta) + iv(r, \theta)$  be an analytic function. If  $u = -r^3 \sin 3\theta$ , then construct the corresponding analytic function  $f(z)$  in terms of  $z$ . [5+5]
- OR**
- 3.a) Show that the function  $f(z)$  defined by  
$$f(z) = \frac{x^2 y^3 (x + iy)}{x^6 + y^{10}} \text{ for } z \neq 0, \quad f(0) = 0$$
is not analytic at the origin, even though it satisfies the Cauchy-Riemann equations at the origin.
  - b) Determine the analytic function whose real part is  $\log \sqrt{x^2 + y^2}$ . [5+5]

4. Represent the function  $\frac{1}{z^2-4z+3}$  in the domain  
(a)  $1 < |z| < 3$  (b)  $|z| < 1$ .

[10]

- 5.a) Expand the function  $f(z) = \frac{z}{(z+1)(z+2)}$  about  $z = -2$ , and name the series thus obtained.

- b) Evaluate  $\oint_C \frac{e^z}{(z+3)(z+2)} dz$ , where  $C$  is the circle  $|z - 1| = \frac{1}{2}$ .

[5+5]

6. Evaluate the integral using contour integration  $\int_0^{2\pi} \frac{d\theta}{2+\cos \theta}$ .

[10]

7. Show that the transformation  $w = i \frac{1-z}{1+z}$  transforms the circle  $|z| = 1$  into the real axis of  $w$  plane and the interior of the circle  $|z| < 1$  into the upper half of the  $w$  plane.

[10]

8. Find the Fourier transform of  $f(x) = \begin{cases} 1-x^2, & \text{if } |x| < 1 \\ 0, & \text{if } |x| > 1 \end{cases}$ . Hence evaluate

$$\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos \frac{x}{2} dx.$$

[10]

- 9.a) Obtain the half range cosine series for

$$f(x) = \begin{cases} kx, & \text{for } 0 \leq x < L/2 \\ k(L-x), & \text{for } L/2 \leq x \leq L \end{cases}$$

- b) Find the Fourier sine transform of  $f(x) = e^{-|x|}$ . Hence show that  $\int_0^\infty \frac{x \sin mx}{x^2+1} dx = \frac{\pi}{2} e^{-m}$

[5+5]

10. A string is stretched and fastened to two points  $L$  apart. Motion is started by displacing the string in the form  $y = a \sin \frac{\pi x}{L}$  from which it is released at time  $t = 0$ . Find the displacement of any point at a distance  $x$  from one end at time  $t$ .

[10]

11. Write down the one dimensional heat equation. Find the temperature  $u(x, t)$  in a slab whose ends  $x = 0$  and  $x = L$  are kept at zero temperature and whose initial temperature  $f(x)$  is given by

$$f(x) = \begin{cases} k, & \text{when } 0 < x < \frac{1}{2}L \\ 0, & \text{when } \frac{1}{2}L < x < L \end{cases}$$

[10]

Code No: 123AN

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

PROBABILITY AND STATISTICS

(Common to ME, CSE, IT, MCT, AME, MIE, MSNT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) If the moment generating function of a random variable X is  $M_X(t) = (1 - 2t)^{-3}$ , then find the mean. [2]

b) A continuous Random variable has the p.d.f  $f(x) = \begin{cases} K + x/6 & \text{if } 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$ . Determine K. [3]

c) If the two coefficients of regression are 0.1 and 0.4, then find the coefficient of correlation. [2]

d) The joint probability density function is given by

$$f(x) = \begin{cases} \frac{x}{5} + Ky, & 0 < x < 1, 1 < y < 5 \\ 0, & \text{elsewhere} \end{cases}$$
. Find the value of K. [3]

e) Define Null hypothesis. [2]

f) If the sample number is 500 and the standard deviation is 15, then find the maximum error with 95% confidence. [3]

g) Define Reneging. [2]

h) Define Mean arrival rate. [3]

i) Define recurrent state. [2]

j) If  $\begin{bmatrix} 0 & x & 0 \\ 0.31 & 0.42 & y \\ 0 & 0.172 & z \end{bmatrix}$  is Transition probability matrix, then find the values of x, y and z. [3]

PART-B

(50 Marks)

2.a) Six cards are drawn from a pack of 52 cards. Find the probability that:

i) At least three are diamonds ii) 4 are diamonds.

b) In a test on electrical bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 40 hrs. Estimate the number of bulbs likely to burn for more than 2140 hrs. [5+5]

OR

- 3.a) A sample of 5 items is selected at random from a box containing 15 items of which 8 are defective find:

i) Mean                      ii) variance of defective items.

- b) 1000 students appear for an examination. It was found that the marks are normally distributed with mean 35 and standard deviation 5. Find the number of students who get marks between 25 and 40. [5+5]

4. The joint probability density function is given by

$$f(x, y) = \begin{cases} x + y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$

Find:

- a) Marginal probability density function for X  
b) Marginal probability density function for Y  
c) Conditional P.D.F of X given Y  
d) Conditional P.D.F of Y given X.

[10]

OR

- 5.a) The equations of two Regression lines are  $7x - 16y + 9 = 0$ ,  $5y - 4x - 3 = 0$ , find the Coefficient of Correlation and the means of x and y.

- b) Calculate the coefficient of rank correlation:

[5+5]

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

6. Given below is the No. of male births in 1000 families with 5 children each. Is this result coincides with the hypothesis that male births are equally probable?

[10]

No. of boys	0	1	2	3	4	5
No. of families	40	300	250	200	30	180

OR

7. The following figures refer to the observations in independent samples

Sample-I 25 30 28 34 24 20 13 32 22 38

Sample-II 40 34 22 20 31 40 30 23 36 17

Analyze whether the samples have been drawn from the populations of equal means.

[10]

8. The milk plant at a city distributes its products by trucks, loaded at the loading dock. It was its own fleet of trucks plus trucks of a private transport company. The trucks arrive at the interval of 20 minutes. The service time is 4 minutes.

a) What is the probability that there are more than or equal to 4 trucks in the queue.

b) What is the waiting time of a truck in the queue?

c) What is the variance of queue length?

d) What is the probability that the waiting time will exceeds 10 minutes? [10]

OR

9. Workers come to tool store room to enquire about special tools. The average time between two arrivals is 90 seconds and the arrivals are assumed to be in Poisson distribution. The average service time is 50 seconds. Determine:

a) Average queue length

b) Average length of non empty queue

c) Average waiting time of an arrival who waits.

[10]

- 10.a) Define:

i) Markov chain

ii) Absorbing Markov chain.

b) Find the equilibrium vector of  $\begin{bmatrix} 0.25 & 0.75 \\ 0.5 & 0.5 \end{bmatrix}$ .

[5+5]

OR

11. If the transition probability matrix is  $\begin{bmatrix} 0.5 & 0.25 & 0.25 \\ 0.5 & 0 & 0.5 \\ 0.25 & 0.25 & 0.5 \end{bmatrix}$  and the initial

probabilities are  $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$  then find:

a) the probabilities after three periods b) Equilibrium vector.

[5+5]

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Code No: 123AW

**R15**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech II Year I Semester Examinations, May/June - 2019**

**SIGNALS AND SYSTEMS**

(Common to ECE, EIE)

**Time: 3 Hours**

**Max. Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) Plot unit Impulse signal and clearly indicate all the values. [2]
- b) Find whether the signal given by  $x(n) = 5\cos(6n)$  is periodic or not. [3]
- c) Find the Fourier transform of  $x(t) = \sin(\omega t)$ . [2]
- d) List any three properties of Fourier transform. [3]
- e) Define time invariant and time varying systems. [2]
- f) Define impulse response of a linear time invariant system. [3]
- g) Write the convolution equation representing its operation. [2]
- h) State the Properties of Auto correlation. [3]
- i) What are the two types of Z transform? [2]
- j) What is the time shifting property of Z transform? [3]

**PART - B**

**(50 Marks)**

- 2.a) Explain the analogy of vectors and signals in terms of orthogonality and evaluation of constant. [4+6]
- b) List the properties of Fourier series. [4+6]

**OR**

- 3.a) State the dirichlet's conditions for existence of Fourier series. [4+6]
- b) Derive the expression for Exponential Fourier series co-efficients. [4+6]
- 4.a) What is the Fourier transform of a Rectangular pulse existing between  $t = -T/2$  to  $t = T/2$ . [5+5]
- b) Find the Fourier transforms of signal  $x(t) = e^{-A(t)} \sin(t)$ . [5+5]

**OR**

- 5.a) What are all the blocks are used to represent the CT signals by its samples? [5+5]
- b) Find the Fourier transform of a signal  $x(t) = e^{-A(t)} \sin \omega t u(t)$ . [5+5]

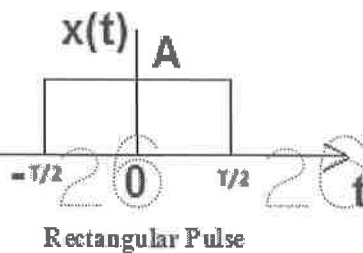
- 6.a) Determine whether the following input-output equations are linear or non linear.  
 i)  $y(t)=x^2(t)$       ii)  $y(t)=x(t^2)$       iii)  $y(t)=t^2x(t-1)$       iv)  $y(t)=x(t) \cos 50\pi t$   
 b) What are the three elementary operations in block diagram representation of CT system? [5+5]

- 7.a) Define system impulse response  $h(t)$ . State the conditions for physical realizability in both time and frequency domains.  
 b) Derive the conditions for distortion less transmission through a system. [5+5]

- 8.a) Determine the convolution of two functions  $x(t)=a e^{-at}$ ;  $y(t)=u(t)$ .

- b) State and prove Parseval's Theorem? [5+5]

9. Determine the convolution of two same Rectangular pulses  $x(t)$  shown in figure and also find its Auto correlation. Prove that both results are same. [10]



- 10.a) Find the z-transform of the following sequences:

- i)  $x[n]=\cos nw. u[n]$       ii)  $x[n]=a^n \sin nw. u[n]$       iii)  $x[n]=a^n u[n]$

- b) Find the Laplace transform of the following function,  $x(t)=(1/t) \sin 2 \omega t$ . [5+5]

- 11.a) Find the Laplace Transform of  $\cos \omega t$  and  $\sin \omega t$  using frequency shifting property.

- b) Compare and contrast Laplace and Fourier Transforms with examples. [5+5]

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Code No: 113BX

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

FLUID MECHANICS AND HYDRAULIC MACHINERY

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) What is surface tension and what is its significance? [2]
- b) Define atmospheric pressure, gauge pressure and vacuum pressure. [3]
- c) Distinguish between stream line and stream tube. [2]
- d) Distinguish between major losses and minor losses. [3]
- e) State different types of storage requirement in hydro electric power plant. [2]
- f) Derive an expression for the force exerted by a jet of water on a inclined flat plate when plate is at rest. [3]
- g) How to select a particular turbine in a particular place? [2]
- h) Define draft tube and explain its significance. [3]
- i) Define Specific speed of a centrifugal pump. [2]
- j) Distinguish between manometric head and static head. [3]

**PART - B**

**(50 Marks)**

- 2.a) Explain the manometer that can be used for very precise measurement of small pressure difference between two points with a neat sketch. [5+5]
  - b) A sleeve 12 cm long encases a vertical metal rod 3.2 cm in diameter with a radial clearance of 0.15mm. When immersed in an oil of viscosity 5.95 poise, the effective weight of the sleeve is 8.5N. Will the sleeve slide down the rod and if so at what velocity? [5+5]
- OR**
- 3.a) What is the difference between U-tube differential manometer and inverted U-tube differential manometer? Where they are used. Why? [5+5]
  - b) The pressure inside a droplet of water is  $0.15 \text{ N/cm}^2$  greater than the atmospheric pressure. Calculate the diameter of the droplet.  
Take surface tension (water with air) = 78 N/m.
- 4.a) How will you determine the loss of head due to friction in pipes by using Darcy formula? [5+5]
  - b) Derive Bernoulli's equation of motion for a flow along a stream line and state the requisite assumptions clearly.

**OR**



- 5.a) Distinguish between momentum equation and impulse momentum equation.  
b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 320 m, 160 m and 200 m and of diameters 310 mm, 180 mm, and 90 mm respectively, is 12 m. Determine the rate of flow of water if Co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering:  
i) Minor losses also  
ii) Neglecting minor losses.

[5+5]

- 6.a) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular in section and the velocity of a vane is half that of jet.

- b) Distinguish between firm power and secondary power in detail.

[5+5]

OR

- 7.a) Derive an expression for force exerted on a series of vanes and also find its efficiency.  
b) Distinguish between storage reservoir and surge tank in detail.

[5+5]

- 8.a) By means of a neat sketch, explain the governing mechanism of Francis Turbine.

- b) A pelton wheel is to be designed for a head of 65 m when running at 220 r.p.m. The pelton wheel develops 91.3674 kW shaft power. The velocity of the buckets is 0.48 times the velocity of the jet, overall efficiency is 0.81 and Co-efficient of the velocity is equal to 0.99.

[5+5]

OR

- 9.a) Define various unit quantities i) Unit power ii) Unit speed iii) Unit discharge.  
b) A turbine develops 9357 kW when running at 16 r.p.m. The head on the turbine is 35 m. If the head on the turbine is reduced to 15 m. Determine the speed and power developed by the turbine.

[5+5]

- 10.a) With a neat sketch, explain the principle and working of a centrifugal pump.

- b) The diameter of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m.

[5+5]

OR

- 11.a) What do you mean by pump characteristics? Briefly explain the uses of such characteristics.

- b) A centrifugal pump is to be discharged  $0.125 \text{ m}^3/\text{s}$  at a speed of 1650 r.p.m. against a head of 21 m. The impeller diameter is 240 mm, its width at outlet is 55 mm and manometric efficiency is 71%. Determine the vane angle at the outer periphery of the impeller.

[5+5]

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Code No: 113AW

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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- (25 Marks)
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  - d) List any three properties of Fourier transform. [3]
  - e) Define time invariant and time varying systems. [2]
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  - i) What are the two types of Z transform? [2]
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PART - B

- (50 Marks)
- 2.a) Explain the analogy of vectors and signals in terms of orthogonality and evaluation of constant. [4+6]
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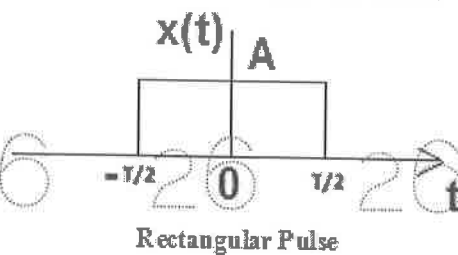
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- 10.a) Find the z-transform of the following sequences:  
 i)  $x[n]=\cos n\omega$ .  $u[n]$       ii)  $x[n]=a^n \sin n\omega$ .  $u[n]$       iii)  $x[n]=a^n u[n]$   
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**PART-B**

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2.a) Six cards are drawn from a pack of 52 cards. Find the probability that:

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b) In a test on electrical bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 40 hrs. Estimate the number of bulbs likely to burn for more than 2140 hrs. [5+5]

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- 3.a) A sample of 5 items is selected at random from a box containing 15 items of which 8 are defective find:

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$$f(x, y) = \begin{cases} x + y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$

Find:

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b) Marginal probability density function for Y  
c) Conditional P.D.F of X given Y  
d) Conditional P.D.F of Y given X.

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[5+5]

OR

11. If the transition probability matrix is  $\begin{bmatrix} 0.5 & 0.25 & 0.25 \\ 0.5 & 0 & 0.5 \\ 0.25 & 0.25 & 0.5 \end{bmatrix}$  and the initial

probabilities are  $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$  then find:

- a) the probabilities after three periods b) Equilibrium vector.

[5+5]

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Code No: 53014

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

PROBABILITY AND STATISTICS  
(Common to ME, CSE, AME, MIE, MSNT)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) A can hit a target once in five shots. B can hit a target twice in 3 shots. C can hit a target once in 4 shots. What is the probability that 2 shots hit the target?  
b) If  $P(A) = 2/3$ ,  $P(B) = 1/5$ , prove that  $\frac{2}{15} \leq P(A \cap B) \leq \frac{1}{5}$ . [7+8]
- 2.a) A student takes a true false examination consisting of 8 questions. He guesses each answer. The guesses are made at random. Find the smallest value of  $n$  that the probability of guessing at least a correct answer is less than  $\frac{1}{2}$ .  
b) The heights of 100 students are normally distributed with mean 68 inches and S.D 5 inches. Find the number of students whose height is greater than 70 inches. [8+7]
- 3.a) Discuss various types of alternative hypothesis with suitable example.  
b) A random sample of boots worn by 40 combat soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.05 years. Under standard conditions the boots are known to have an average life of 1.28 years. Is there reason to assert at a level of significance of 0.05 that use in the desert causes the mean life of such boots to decrease? [7+8]
- 4.a) Construct 95% confidence interval for the true proportion of computer literates if 47 out of 150 persons from rural areas are computer literates.  
b) In a certain city 125 men in a sample of 500 were found to be smokers. In another city, the number of smokers was 375 in a random sample of 1000. Does this indicate that there is a greater population of smokers in the second city than in the first? [7+8]
- 5.a) Write the uses of t-distribution.  
b) Weights in kg. of 10 students are given as 38, 40, 45, 53, 47, 43, 55, 48, 52, 49. Can we say that variance of the distribution of weights of all students from which the above sample was taken is equal to 20 square kg. [7+8]
- 6.a) For 20 army personal, the regression of weight of kidneys ( $y$ ) on weight of heart ( $x$ ) both measured in Australia is  $y = 0.399x + 6.394$  and the regression of weight of heart on weight of kidneys is  $x = 1.212y - 2.461$ . Find the correlation coefficient between the two variables and also their means.  
b) The difference between the ranks are 0.5, -6, -4.5, -3, -5, -1, 3, 0, 5, 5.5, 0 and -0.5 for refracted ranks  $x$  and  $y$   $\sum \frac{m(m^2-1)}{12} = 3.5$ . The rank correlation coefficient is 0.44. Find the number of terms. [8+7]

7.a) In a colour T.V. manufacturing plant, a loading unit takes exactly 10 minutes to load 2 T.V. sets into a wagon and again comes back to the position to another set of T.V. If the arrival rate is 2 T.V. sets per 20 minutes. Calculate the average time of T.V. sets in a stationary state.

b) Define the different states of the queuing system.

[7+8]

8. The transition probability matrix of a Markov chain  $\{x_n\}$ ;  $n = 1, 2, 3$  having three

states 1, 2 and 3 is  $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$  and the initial distribution is

$P(0) = (0.7, 0.2, 0.1)$ . Find:

a)  $P\{X_2 = 3\}$

b)  $P\{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$ .

[15]

---ooOoo---