AR18

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	What is the need to study of biology and explain it with a suitable example	6M
	b)	Examine the role of biological contributions in engineering during 18th century	6M

(OR)

2.	a)	What are the cotemporary aspects of biology as an independent scientific discipline	6M
	b)	Explain physical properties of Cytoplasm with reference to Brownian movement	6M

UNIT-II

3.	a)	Compare and contrast between Prokaryotes and Eukaryotes	6M
	b)	What are the principles of taxonomy? and mention three kingdoms of life	6M

(OR)

4.	a)	Describe the structure and functions of compound microscope	6M
	b)	Summarize the main constituents in culture media along with their functions	

UNIT-III

5.	a)	Derive Mendel's Laws of inheritance from his experiments	6M
	b)	Explain different phases of Mitosis and its significance	6M

(OR)

6.	a)	Describe the double helix structure of the DNA molecule	6M
	b)	Write in brief about the concept of Genetic Code	6M

UNIT-IV

7.	a)	Write about the classification and nomenclature of Enzymes	6M
	b)	Explain the Mechanism of enzyme action with suitable examples	6M

(OR)

8.	a)	Discuss the Enzyme kinetics and kinetic parameters	6M
	b)	Examine the role of proteins as enzyme transporters and receptors	6M

UNIT-V

9.	a)	Define endothermic reaction and demonstrate the Glycolysis cycle	6M
	b)	Explain the light reaction of Photosynthesis in plants	6M

(OR)

10.	a)	What is exergonic reaction and demonstrate the Krebs cycle	6M
	b)	Evaluate the process of CO_2 fixation through the Kelvin cycle	6M

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AR18

CODE: 18BST204   **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

COMPLEX VARIABLES AND STATISTICAL METHODS
(Common to EEE, ME & ECE)

Time: 3 Hours   **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. If f(z) is an analytic function of z, then prove that $\left(\dfrac{\partial^2}{\partial x^2} + \dfrac{\partial^2}{\partial y^2} \right) \left| f(z) \right|^2 = 4 \left| f^{1}(z) \right|^2$ 12M

(OR)

2. a) Prove that $u(x,y) = e^{x}\left(x\cos y - y\sin y \right)$ satisfies the laplace equation and find the corresponding analytic function f(z) = u +iv   6M

    b) Show that the function $u(x,y) = e^{x} Cosy$ is harmonic.   6M

UNIT-II

3. Evaluate $\int_{c}\left(\dfrac{e^{z}}{z^3} + \dfrac{z^4}{(z+i)^2} \right) dz$, where $c : \left| z \right| = 2$ using Cauchy's integral formula.   12M

(OR)

4. a) Evaluate $\int_{c}\left(\dfrac{2e^{z}}{z(z-3)} \right) dz$, where $c : \left| z \right| = 2$ using Residue theorem.   6M

    b) Determine the poles and corresponding residues of $\dfrac{z+1}{z^2(z-2)}$ 6M

UNIT-III

5. In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution.   12M

(OR)

6. a) The mean height of students in a college is 155cms and standard deviation is 15. What is the probability that the mean height is of 36 students is less than 157cms.   6M

    b) The normal population has a mean of 0.1 and standard deviation of 2.1 . Find the probability that mean of a sample of size 900 will be negative.

UNIT-IV

7. a) A die is tossed 960 times and it falls with 5 upwards 184 times. Is the die unbiased at a level of significance of 0.01 ?   6M

    b) Define Null hypothesis and Alternative hypothesis and Test of Significance   6M

(OR)

8.   A random sample of 10 boys had the following I.Q,s: 12M
70,120,110,101,88,83,95,98,107,100
   a) Do this data support the assumption of a population mean I.Q of 100 ?
   b) Find a reasonable range in which most of the mean I.Q values of samples
      10 boys lie

UNIT-V

9.   Fit a second order parabola to the following data given below: 12M

x	1	2	3	4	5
y	10	12	8	10	14

(OR)

10.   Calculate Karl Pearson's Coefficient of Correlation from the data   12M

Wages	100	101	102	102	100	99	97	98	96	95
Cost of Living	98	99	99	97	95	92	95	94	90	91

AR16

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020
ENVIRONMENTAL ENGINEERING-I
(Civil Engineering)

Time: 3 Hours   Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	What are the different types of water demands? Explain in detail.	7M
	b)	What are the various water born diseases? Explain in detail	7M

(OR)

2.	a)	What are the variations or fluctuations in water demand? Explain in detail.	6M
	b)	Estimate the population of the town in the year 1981, 1991 & 2001 by Arithmetic increase method, Geometrical increase method and Incremental increase method.	8M

Year	1941	1951	1961	1971
Population in thousands	242	485	770	1090

UNIT-II

3.	a)	What are the various types of Intakes? Explain Reservoir Intake in detail with neat sketch.	6M
	b)	What is the Classification based on method of layout of distribution? Explain in detail.	8M

(OR)

4.	a)	Explain factors effecting selection of site for intake construction.	6M
	b)	Explain importance and working of sluice valve in distribution system with neat sketch.	8M

UNIT-III

5.	a)	What is meant by sedimentation principle? Derive the equation for stoke's law	7M
	b)	What are the various types of coagulation feeding devises? Explain in detail.	7M

(OR)

6.	a)	What are the factors effecting sedimentation? Explain in detail.	6M
	b)	Calculate size of a rectangular sedimentation tank to treat 8 million litres of raw water per day. Assume surface over flow rate 30000 l/day/m^2 and detention period 3 hr.	8M

UNIT-IV

7.	a)	What are the differences of slow sand filter and rapid sand filter?	7M
	b)	What is meant by disinfection? What are the various methods of disinfection? Explain any one method in detail.	7M

(OR)

8.	a)	What is meant by Residual Chlorine? Explain the procedure to determine the Residual Chlorine	7M
	b)	What are the different types of filters? Explain pressure filter with neat sketch.	7M

UNIT-V

9.	a)	What are the different Sources and classification of solid waste? Explain in detail.	7M
	b)	Explain Disposal of solid waste by composting method in detail.	7M

(OR)

10.	a)	Write about collection and Transportation of solid waste.	7M
	b)	List out Disposal methods of Solid Waste. Explain method of Land filling in brief.	7M

AR16

Code : 16ME2008   SET – 2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

FLUID MECHANICS AND HYDRAULIC MACHINERY
(Common to EEE & MECH)

Time : 3 hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions carry equal marks
All parts of the Question must be answered at one place

UNIT - I

1 (a) State and prove the 'Pascal's Law'.   7M

   (b) A Cylinder of 0.3 m diameter rotates concentrically inside a fixed cylinder of   7M
        0.31 m diameter. Both the cylinders are 0.3 m long. Determine the viscosity of
        the liquid which fills the space between the cylinders if a torque of 0.9 N-m is
        required to maintain an angular velocity of 60 r.p.m.

(OR)

2. (a) Explain the classification of fluid flows.   8M

   (b) Discuss the Stream function and velocity potential function.   6M

UNIT - II

3 (a) State Momentum equation. How will you apply momentum equation for   7M
        determining the force exerted by a flowing liquid on a pipe bend?

   (b) A 500 reducing bend is connected in a pipe line, the diameters at the inlet and   7M
        outlet of the bend being 550 mm and 250 mm respectively, find the force
        exerted by water on the bend if the intensity of pressure at inlet to bend is 9.5
        N/cm2 and rate of flow of water is 650 litres/sec.

(OR)

4 (a) Explain the principle of Venturimeter with neat sketch. Derive an equation for   8M
        the rate of flow through it.

   (b) An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm   6M
        diameter. The pressure difference measured by a mercury oil differential
        manometer on the two sides of the orifice meter gives a reading of 50 cm of
        mercury. Determine the rate of flow of oil of sp. gr.0.9, when the coefficient of
        discharge of the meter is 0.64.

UNIT - III

5 (a) Differentiate between (i) Major energy loss and Minor energy loss (ii) Pipes in   8M
        series and Pipes in parallel.

   (b) Determine the difference in the elevations between the water surfaces in the two   6M
        tanks which are connected by a horizontal pipe of diameter 300 mm and length
        400m. The rate of flow of water through the pipe is 300 lt/s. Consider all losses
        and take the value of coefficient of friction = 0.008

(OR)

6 (a) Obtain an expression for the force exerted by a jet of water on a moving vertical plate in the direction of the jet. **6M**

(b) A jet of water having a diameter of 65 mm and the head of water at the center of the nozzle is 100 meters strikes a flat plate, the normal of which is inclined at 550 to the axis of the jet.   Find the normal force on the plate, when (i) the plate is stationary, (ii) the plate is moving with a velocity of 16 m/sec in the direction of the jet. Also determine the power and efficiency of the jet, when the plate is moving. Take Cv as 0.96. **8M**

UNIT - IV

7 (a) Describe briefly the function of various components of Pelton turbine with neat sketches. **8M**

(b) A Kaplan turbine runner is to be designed to develop 7500 kW shaft power. The net available head is 10 m. Assume that the speed ratio is 1.8 and flow ratio 0.6. If the overall efficiency is 70% and diameter of the boss is 0.4 times the diameter of the runner, find the diameter of the runner, its speed and specific speed. **6M**

(OR)

8 (a) Explain the characteristic curves of a turbine. **7M**

(b) A turbine is to operate under a head of 25 m at 200 r.p.m.   The discharge is 9 cumecs. If the overall efficiency is 90%, determine the performance of the turbine under a head of 20 m. **7M**

UNIT - V

9 (a) Explain the principle and working of a Centrifugal Pump with a neat sketch. **7M**

(b) The Centrifugal Pump delivers water against a head of 14.5 m and a design speed of 1000 r.p.m. The vanes are curved back to an angle of 300 with the periphery. The impeller diameter at outlet is 300 mm and width at outlet is 50 mm. Determine the rate of flow, if manometric efficiency is 95%. **7M**

(OR)

10 (a) With a neat sketch explain the working of a Reciprocating Pump. **7M**

(b) A single acting reciprocating pump, running at 50 r.p.m. delivers 0.01 m3/s of water. The diameter of the piston is 200 mm and stroke length is 400 mm. Determine, (i) the theoretical discharge of the pump, (ii) Coefficient of discharge and   (iii) Slip and the percentage slip of the pump. **7M**

AR16

UNIT-I

1. Discuss briefly different types of DC generators.   14M

(OR)

2. A 250V,15 kW shunt motor has a maximum efficiency of 88% and a speed of 700r.p.m.,when delivering 80% of its rated output. The resistance of its shunt field is 100 ohms. Determine the efficiency and speed when the motor draws a current of 78 A from the mains.   14M

UNIT-II

3. Explain the principle of operation of single phase transformers and derive the EMF equation of a transformer?   14M

(OR)

4. a) Discuss briefly voltage regulation and efficiency of a transformer?   7M
   b) A 40 kVA transformer has iron loss of 450W and full load copper loss of 850W. If the power factor of the load is 0.8 lagging, calculate (i) full load efficiency (ii) the load at which the maximum efficiency occurs.   7M

UNIT-III

5. Derive the torque equation of 3-Phase induction motor and also draw torque-slip characteristics.   14M

(OR)

6. a) Explain the principle of operation of single phase induction motor?   7M
   b) Differentiate between SRIM and SCIM?   7M

UNIT-IV

7. Define voltage regulation and explain about synchronous impedance method to determine regulation of an alternator.   14M

(OR)

8. a) Develop the equation of generated EMF in an alternator?   7M
   b) Explain construction details of an alternator.   7M

UNIT-V

9. Explain the construction and operation of Moving Iron instruments.   14M

(OR)

10. a) Explain the principle of operation of moving coil instrument   7M
    b) Give the importance of damping torque in measuring instruments   7M

AR16

CODE: 16BS2005   **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

PROBABILITY AND STATISTICS
(Common to CSE & IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) (i) Write the Probability axioms.   **[7M]**
   (ii) A Card is drawn at random from a well shuffled pack of playing cards then what is the probability that the card is either King or Queen?
   b) Let X denote the sum of two numbers that appear when a pair of dice is thrown.   **[7M]**
   Determine (i) Probability Distribution (ii) Mean (iii) Variance.

(OR)

2. a) State Baye's theorem.   **[7M]**
   Bag A contains 2 white and 3 red balls and bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that the red ball drawn from bag B.
   b) If A and B are two events and $P(A)=\dfrac{1}{3}$, $P(B)=\dfrac{1}{4}$ & $P(A \cup B)=\dfrac{1}{2}$ then find   **[7M]**

   (i) $P(A \cap B)$ (ii) $P(A^C)$ (iii) $P\left(\dfrac{B}{A}\right)$ (iv) $P\left(\dfrac{A}{B}\right)$

UNIT-II

3. a) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random   **[7M]**
   (i) None is defective (ii) one is defective (iii) $P(1 < x < 4)$
   b) Suppose the weights of 800 students are normally distributed with mean 140 Pounds and S.D is 10 Pounds. Find the number of students whose weights are   **[7M]**
   (i) Between 138 and 140 Pounds.
   (ii) More than 152 Pounds.

(OR)

4. a) Fit a Poisson distribution for the following data and calculate the expected frequencies.   **[7M]**

x	0	1	2	3	4
f(x)	109	65	22	3	1

   b) Ten Coins are thrown simultaneously. Find the probability of getting at least   **[7M]**
   (i) Seven heads (ii) Six heads.

5.   A Population consists of five numbers 3, 6, 9, 15, 27. Consider all samples of size **[14M]**
three that can be drawn without replacement from this population. Find
  (i) The Population mean,
  (ii) The Population Standard deviation,
  (iii) The mean of the sampling distributions of the means,
  (iv) The S.D of the sampling distributions of the means.

(OR)

6. a)   A Normal population has a mean of 0.1 and S.D of 2.1. Find the probability that **[7M]**
mean of a sample size 900 will be negative.

   b)   It is desired to estimate the mean number of hours of continuous use until a certain **[7M]**
computer will first require repairs. If it can be assumed that the S.D is 48 hours.
How large the sample will be needed so that one will be able to assert with 95%
confidence that the sample mean is off by at most 10 hours.

UNIT-IV

7. a)   In 16 one-hour test runs, the gasoline consumption of an engine averaged 16.4 **[7M]**
gallons with S.D of 2.1 gallons. Test the claim that the average gasoline
consumption of this engine is 12.0 gallons per hour.

   b)   1000 students at college level were graded according to their I.Q and the economic **[7M]**
condition of their homes. Use Chi-Square test to find out whether there is any
association between economic conditions at home and I.Q.

Economic	I.Q	
Condition	*High*	*Low*
Rich	460	140
Poor	240	160

(OR)

8. a)   A Manufacturer claims that only 4% of his products are defective. A random **[7M]**
sample of 500 were taken among which 100 were defective. Test the hypothesis at
0.05 level.

   b)   The mean life of sample of 10 electric bulbs was found to be 1456 hours with S.D **[7M]**
of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a
mean life of 1280 hours with S.D of 398 hours. Is there a significant difference
between the means of two batches?

UNIT-V

9.   Find the Coefficient of Correlation to the following data **[14M]**

X	100	101	102	102	100	99	97	98	96	95
Y	98	99	99	97	95	92	95	94	90	91

(OR)

10. a)   Fit the Curve $y = a\,e^{bx}$ to the following data **[7M]**

x	77	100	185	239	285
y	2.4	3.4	7.0	11.1	19.6

   b)   Find the mean values of variables x & y and Correlation Coefficient from the **[7M]**
equations $2y - x - 50 = 0, 3y - 2x - 10 = 0$.

AR13

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2020

COMPLEX VARIABLES AND STATISTICAL METHODS
(Common to CE & MECH.)

Time: 3 Hours   **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) Define Harmonic function.
   b) Define Pole.
   c) State Cauchy's Integral formula.
   d) Define Bilinear transformation.
   e) Define Residue of a function f(z).
   f) State Taylor's theorem.
   g) State Baye's theorem.
   h) Write moment generation function of Binomial distribution.
   i) Write the test statistic for single mean and two means in small samples.
   j) What is F-test and write any two of its properties.

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) If f(z) is an analytic function with constant modulus, then prove that f(z) is constant.   6 M

   b) Evaluate $\int_{C} \dfrac{e^{2z} + z^5}{(z+i)^5} dz$, where $C : |z| = 3$ using Cauchy's integral formula.   6 M

(OR)

3. a) Determine analytic function f(z) whose real part is $y + e^{x} \cos y$.   6 M

   b) Find Taylor's series expansion of $f(z) = \dfrac{1}{(z+1)(z+3)}$ about the point z = 2.   6 M

UNIT-II

4. a) Using Cauchy's residue theorem, evaluate   6 M

   $\int_{C} \dfrac{z}{(z-2)^2 (z-1)} dz$, where $C : |z - 2| = \dfrac{1}{2}$

   b) Find Laurent's series expansion of $f(z) = \dfrac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$ 6 M

   in the region $3 < |z + 2| < 5$.

(OR)

5. Using Cauchy residue theorem, evaluate $\int_{-\infty}^{\infty} \dfrac{x^2}{(x^2+4)(x^2+9)}\, dx$ 12M

UNIT-III

6. a) Explain about the transformation $w = z^2$.   6 M

   b) Under the transformation $w = \dfrac{1}{z}$ find the image of the circle $|z - 2i| = 2.$ 6 M

   (OR)

7. Under the transformation $w = \dfrac{z-1}{z+1}$ show that the map of the straight line x = y is a circle and find its centre and radius.   12 M

UNIT-IV

8. a) Three machines A , B and C produce identical items. Of their respective output 5 %, 4% , and 3% of items are faulty. On a certain day , A has produced 25% of the total output, B has produced30% and C the remainder. An item selected at random is found to be faulty. What are the chances that it was produced by the machine with the highest output ?.   6 M

   b) The probability density function of a variable X is   6 M

X :	0	1	2	3	4	5	6
P(X) :	k	3k	5k	7k	9k	11k	13k

   Find i) P(X < 4)   and ii) P (3 < X < 6).

   (OR)

9. The mean height of 500 students is 151 cm. and the standard deviation is 15 cm. Assuming that the heights are normally distributed. Find how many students heights lie between 120 and 155 cm.   12M

UNIT-V

10. a) The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0cm respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5cm   6 M

    b) The following table gives the number of aircraft accidents that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week ?   6 M

Days	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
No. of accidents	14	16	8	12	11	9	14	84

    (OR)

11. a) Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches^2 and 91 inches^2 respectively. Can these be regarded as drawn from the same normal population ?   6 M

    b) Two samples of 9 and 7 individuals have variances 4.8 and 9.6 respectively. Is the variance 9.6 significantly greater than the variance 4.6 .   6 M

AR13

Time: 3 Hours   **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) What is meant by self excited generator?
    b) Why the starter is necessary for a DC motor?
    c) Write the EMF equation of transformer
    d) How do you reduce Eddy Current Losses in a Transformer ?
    e) Define slip of an induction motor?
    f) Give the operating principle of induction motor
    g) Define distribution factor
    h) Write an expression to find the voltage regulation of Alternator
    i) Give the classification of measuring instruments
    j) What is the importance of deflecting torque in indicating instruments

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) Derive the expression for emf of a DC generator   6M
    b) Explain the principle of operation of DC generator.   6M

(OR)

3. a) With the help of neat sketches, explain torque-speed characteristics of the dc series   6M
        motor and dc shunt motor
    b) Derive the torque equation of DC motor.   6M

UNIT-II

4. a) Explain the principle of operation of a Single Phase Transformer   6M
    b) A 40 kVA transformer has iron loss of 450W and full load copper loss of 850W. If   6M
        the power factor of the load is 0.8 lagging, calculate (i) full load efficiency (ii) the
        load at which the maximum efficiency occurs.

(OR)

5.   Explain the procedure to conduct the OC test and SC test on a single phase   12M
        transformer to determine the efficiency.

UNIT-III

6. a) Explain the principle of operation 3 phase induction motor.   6M
    b) A 3-phase, 415V, 6 pole, 50 Hz induction motor rotates at 945 rpm. Find the   6M
        synchronous speed and slip. Also find the rotor frequency.

(OR)

7. a) Explain how the rotating magnetic field is developed in a 3-phase induction motor.   6M
    b) A 24 pole, 50 Hz, star connected induction motor has rotor resistance of 0.016   6M
        ohms per phase and rotor reactance of 0.265 ohms per phase at stand still. It is
        achieving its full load torque at a speed of 247 rpm. Calculate the ratio of i) full
        load torque to maximum torque, ii) starting torque to maximum torque.

UNIT-IV

8. a) Derive the expression for EMF generated in an Alternator.   6M
   b) Explain the principle of operation of an alternator.   6M

(OR)

9. a) Derive the expressions for pitch factor and distribution factor for an alternator   6M
   b) A 6-pole 3-phase, 50Hz alternator has 12 slots per pole and four conductors per slot. The winding is five-sixths pitch. The flux per pole is 1.5wb; the armature coils are all connected in series. The winding is star connected. Calculate the induced E.M.F per phase.   6M

UNIT-V

10. Explain the construction and operation of Moving Iron instruments.   12M

(OR)

11. a) Explain the principle of operation of moving coil instrument   6M
    b) Give the importance of damping torque in measuring instruments   6M

AR13

Time: 3 Hours   **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) Define mutually exclusive events.
    b) Define continous random variable.
    c) Write the moment generating function of Poisson distribution.
    d) Define population and parameter.
    e) Define null hypothesis.
    f) What is the correction factor if n= 5 and N = 200
    g) Define correlation.
    h) Write the UCL for p chart.
    i) Write the formula for single mean of large sample.
    j) Write traffic intensity formula of queuing theory.

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a   . A Random variable X has the following probability distribution.   6

X	1	2	3	4	5	6	7	8
P(X)	K	2K	3K	4K	5K	6K	7K	8K

Find the value of (i) K (ii) $P(X \leq 2)$ (iii) $P(2 \leq X \leq 5)$

   b   Out of 15 items 4 are not in good condition. 4 items are selected at random. Find   6
        the probability that (i) all are good   (ii)   Two are not good.

(OR)

3. a   Prove that (i) $E(ax+b) = a E(x) +b$ (ii) $E(a+x) = a+ E(x)$ 6
    b   Three machines 1,2,3 produce 40%, 30% , 30% of the total number of items of   6
         factory. The percentage of defective items of these machines are 4%, 2%, 3%. If an
         item is selectd at random, find the probability that the item is defective.

UNIT-II

4. a   Fit a Poisson distribution.   6

x	0	1	2	3	4
f	109	65	22	3	1

   b   A random sample of size 100 is taken from a population with σ = 5.1 given that   6
        the sample mean is $\bar{x}$ = 21.6. Construct a 95% confidence interval for the
        population mean µ.

(OR)

5. a   If X is normal variate with mean 30 and standard deviation 5. Find (i) $P(26 \leq X \leq 40)$ 6
         (ii) $P(X \geq 45)$
    b   A population consists of six numbers 4,8,12,16,20,24. Consider all samples of size   6
          two which can be drawn without replacement from city population. Find
                 i.The population mean   ii.The population standard deviation
                 iii.The mean of the sampling distribution of means
                 iv.The standard deviation of the sampling distribution of means.

UNIT-III

6. a An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level of significance.   6

   b In two large populations, there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations.   6

(OR)

7 Three samples each of size 5 were drawn from three uncorrelated normal populations with equal variances. Test the hypothesis that the population means are equal at 5% level.   12

Sample-1	10	12	9	16	13
Sample-2	9	7	12	11	11
Sample-3	14	11	15	14	16

UNIT-IV

8 Obtain the rank correlation coefficient for the following data.   12

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

(OR)

9. a Determine the regression line of X on Y for the following data.   6

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

   b The following figures give the number of defectives in 20 samples containing 2000 items. Calculate the values for central line and control charts for p-chart.   6

   425, 430, 216, 341, 225, 322, 280, 306, 337, 305, 356, 402, 216, 126, 409, 193, 280, 326, 389

UNIT-V

10. a Explain the operating characteristics of a queueing system.   6

    b 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 distribution is also exponential with an average of 36 minutes. Calculate: 6
    (i) Expected queue size
    (ii) Probability that the queue size exceeds 10

(OR)

11. a Explain the classification of queueing models.   6

    b Vehicles arrive at a toll booth at an average rate of 300 per hour. Average waiting time at the toll booth is 10s per vehicle. If both arrivals and departures are exponentially distributed, what is the average number of vehicles in the system and queueu.   6