**POORNIMA UNIVERSITY, JAIPUR**

**END SEMESTER EXAMINATION, November 2022**

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|  | **2BT3101** | Roll No. | Total Printed Pages: 2 |
| **2BT3101** |  |
| B. Tech. III Semester (Back) End Semester Examination, November 2022  **(CE / CC)** | |
| **BCE03101 / BCC03101 : Engineering Mathematics-II** | | | |

# Time: **3** Hours. Total Marks: **60**

Min. Passing Marks: **21**

Attempt **five** questions selecting one question from each Unit. There is internal choice from Unit I to Unit V. Marks of each question or its parts are indicated against each question / parts. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Use of following supporting material is permitted during examination for this subject.

# **1.--------------------------Nil--------------------** **2.------------------Nil-----------------------**

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|  |  | **UNIT-I (CO1)** | **Marks** | **Bloom Level** |
| **Q.1** | **(a)** | A and B are two mutually exclusive events. If P(A) = 0.25, P(B) = 0.40 and P(AUB) = 0.50, find the values of P(AB) and P(A). | **(6)** | Evaluating |
|  | **(b)** | Four persons are chosen at randam from a group containing 3 men, 2 women and 4 children. Show that the probability that exactly two of them are children is 10/21 | **(6)** | Evaluating |
|  |  | **OR** |  |  |
| **Q.2** | **(a)** | If from a lottery of 30 tickets marked 1, 2, 3,…., 30, four are drawn, find the chance that those marked 1 and 2 are among them. | **(6)** | Analyzing |
|  | **(b)** | A bag contains 4 white and 2 black balls, and a second bag contains 3 of each colour. A bag is drawn at random and a ball is then selected at random from the bag chosen. What is the probability that the ball selected is white. | **(6)** | Analyzing |
|  |  | **UNIT-II (CO2)** |  |  |
| **Q.3** | **(a)** | From the following table of bivariate frequency distribution, calculate the coefficient of correlation between heights and weights of children: | **(6)** | Evaluating |
|  | **(b)** | Marks of 12 students in Arithmetic and Algebra are given below:   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Arithmetic | 60 | 34 | 40 | 50 | 45 | 40 | 22 | 43 | 42 | 66 | 64 | 46 | | Algebra | 75 | 32 | 33 | 40 | 45 | 33 | 12 | 30 | 34 | 72 | 41 | 57 |   Calculate the rank correlation coefficient | **(6)** | Evaluating |
|  |  | **OR** |  |  |
| **Q.4** | **(a)** | Calculate the coefficient of correlation | **(6)** | Evaluating |
|  |  | |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | x | 65 | 63 | 61 | 64 | 68 | 62 | 70 | 66 | | y | 68 | 66 | 68 | 65 | 69 | 66 | 68 | 65 | |  |  |
|  |  |  |  |  |
|  | **(b)** | In a partially destroyed laboratory record of an analysis of correlation data, the following results are legible. Variance of x=9  Regression equations: 4x - 5y + 33 = 0 and 20x - 9y = 107. What were  (a) the mean values of x and y (b) the standard deviation of y  (c) the coeff, of correlation between x and y? | **(6)** | Evaluating |
|  |  | **UNIT-III (CO3)** |  |  |
| **Q.5** |  | Mr. X purchases a new car every two years. He prefer a brand A car but sometimes buy another brand. For mplicity, suppose we designate as brand B any other car which he may purchase. To add a little spice to the car buying Mr X have devised a method of randomly selecting each new car. He place ten slip numbered 1 through 10, in a bow! and draw one slip. If the present car is brand A and the number on the slip is 8 or less, he will again purchase brand A. Thus, ther is a probability of 0-8 that the next car will also be brand A. If he presently oun a brand B car and the number on the slip is 6 or less, he will next purchase a brand A car. The probability they switch back to a brand A car is then 0.6. | **(12)** | Evaluating |
|  |  | (1) Construct and interpret the state transition matrix in terms of  (a) retention and loss, (b) retention and gain.  (ii) Calculate the probability of Mr. X purchasing Brand A car at the end of second period, third period. Draw the transition probability diagrams and the transition trees.  (iii) Calculate the probability of Mr. X purchasing Brand B car at the end of second period, third period. |  |  |
|  |  | **OR** |  |  |
| **Q.6** | **(a)** | Three manufacturers X, Y and Z are competing with each other The following matrix gives the transition probabilities that customers will move from one manufacturer to the other in any month. Interpret the matrix in terms of (a) retention and loss, (b) retention and gain. | **(6)** | Analyzing |
|  | **(b)** | The price of an equity share of a company may increase decrease or remain constant on any given day. It is assumed that the change in price on any day affects the change on the following day as described by the following transition matrix:  (i) If the prices of the share decreased today, what are the chances that it will increase tomorrow?  (it) If the price of the share remained unchanged today, what are the chances that it will increase decrease or remain unchanged day after tomorrow? | **(6)** | Analyzing |
|  |  | **UNIT-IV (CO4)** |  |  |
| **Q.7** | **(a)** | A Self store employs one cashier at its counter. Nine customers arrive on an average 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Possion distribution of arrival rate and exponential distribution for service rate, Find | **(6)** | Evaluating |
|  |  | (i) Average number of customers in system (ii) Average number of customers in queue |  |  |
|  |  | (iii) Average time a customer’s spends in system  (Iv) Average time a customer’s waits before being served |  |  |
|  | **(b)** | A person repairing radios finds that the time spent on the radio set has been exponential distribution while mean 20 minutes. If the radios are repaired in the order in which they come in and their arrival is approximately Possion with an average rate 15 for 8 hour day, what is the repairment’s expected idle time each day? How many jobs are ahead of the average set just brought in? | **(6)** | Evaluating |
|  |  | **OR** |  |  |
| **Q.8** | **(a)** | Customers arrive at the First Class Ticket counter of a Threatre at a rate of 12 per hour. There is one clerk serving the customers at a rate of 30 per hour Assuming the conditions for use of the single channel queuing model, evaluate:  (a) the probability that there is no customer at the counter (i.e., that the system is idle).  (b) the probability that there are more than 20 customers at the counter,  (c) the probability that there is no customer waiting to be served,  (d) the probability that a customer is being served and nobody is waiting. | **(6)** | Evaluating |
|  | **(b)** | Arrival rate of telephone call at a telephone booth are according to Poission distribution with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes | **(6)** | Analyzing |
|  |  | (i) Determine the probability that is formed from time to time  (ii) Find the average queue length that is formed from time to time  (iii) The telephone company will install a second booth when convinced that an arrival whould expect to have to wait at least four minutes for the phone. Find the increase in flow of arrival which will justify second booth |  |  |
|  |  | **UNIT V (CO5)** |  |  |
| **Q.9** |  | Automatic car wash facility operates with only one bay. Cars arrive according to a Passion process, with mean of 4 cars per hour and may wait in the facility's parking lot of the bay is buy. If the service time for all cars is constant and equal to 10 min determine.  (i) mean no of customers in the system (ii) mean no of customers in the queen  (iii) mean waiting time in the system (iv) mean waiting time in the queue | **(12)** | Analyzing |
|  |  | **OR** |  |  |
| **Q.10** |  | In a heavy machine shop, the overhead crane is 75% utilized. Time Study observations grave the average service time as 10.5 minutes. With a SD of 8.8 minutes. What is the average calling rate for the services of the crane, and what is the average delay in getting services of the average se service time is cut to 8.0 minutes, with S.D of 6 minutes. How much reduction will occur, on average, in the delay of getting served? | **(12)** | Evaluating |