Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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(A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS

IV SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

MAKE-UP EXAMINATION

Subject (Name & Code): Engineering Mathematics IV & MAT 2252

Date of Examination: Time: MAX.MARKS: 50

<table>
<tr><th>Q. No.</th><th>Question</th><th>M</th><th>CO</th><th>PO</th><th>BL</th></tr>
<tr><td>1A.</td><td>Use simplex method to maximize the objective function $z(x, y) = x + 3y$ subject to the constraints:
$x + 2y \leq 10$
$x \leq 5$
$y \leq 4$
$x, y \geq 0.$</td><td>4</td><td>6</td><td>1</td><td>3</td></tr>
<tr><td>1B.</td><td>An investor has Rs 20 lakhs with her and considers three schemes to invest the money in for a year. The expected returns are 10%, 12%, and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2. The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units. Formulate a linear programming model (LP model) to maximize her profit (no need to solve the LP model).</td><td>3</td><td>6</td><td>1</td><td>3</td></tr>
<tr><td>1C.</td><td>Find out the median and mode from the following data:
<table><tr><td>Class:</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td><td>80-90</td></tr><tr><td>Frequency:</td><td>5</td><td>9</td><td>14</td><td>20</td><td>25</td><td>15</td><td>8</td><td>4</td></tr></table></td><td>3</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>2A.</td><td>A car repair is either on time or late and either satisfactory or unsatisfactory. If a repair is made on time, then there is a probability of 0.85 that it is satisfactory. There is a probability of 0.77 that a repair will be made on time. What is the probability that a repair is made on time and is satisfactory?</td><td>4</td><td>3</td><td>1</td><td>3</td></tr>
<tr><td>2B.</td><td>In a game a player either loses $1 with a probability 0.25, wins $1 with a probability 0.4, or wins $4 with a probability 0.35. What are the expectation and the standard deviation of the winnings?</td><td>3</td><td>3</td><td>1</td><td>3</td></tr>
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2C.	In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate means of x, y, and the coefficient of correlation between x and y.	**3**	**2**	**1**	**3**
3A	In a normal distribution, 31% of the observations are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.	**4**	**5**	**1**	**3**
3B	Despite a series of quality checks by a company that makes television sets, there is a probability of 0.0007 that when a purchaser unpacks a newly purchased television set it does not work properly. If the company sells 250,000 television sets a year, estimate the probability that there will be no more than 200 unhappy purchasers in a year.	**3**	**5**	**1**	**3**
3C	Investments are made in ten companies, and for each company there is a probability of 0.65 that the investment will deliver a profit. What is the probability that at least half of the investments will deliver a profit? What is the expected number of companies that will deliver a profit?	**3**	**5**	**1**	**3**
4A	For a distribution, the mean is 10, variance is 16, γ_1 is +1 and β_2 is 4. Find the first four moments around the origin.	**4**	**2**	**1**	**3**
4B	On average there are four traffic accidents in a city during one hour of rush-hour traffic. Use the Poisson distribution to calculate the probability that in one such hour there are (a) no accidents (b) at least two accidents.	**3**	**5**	**1**	**3**
4C	The mean annual salary paid to all employees of a company was annual salary paid to all employees of a company was \$5000. The mean annual salaries paid to male and female employees were \$5200 and \$4200, respectively. Determine the percentage of males and females employed by the company.	**3**	**1**	**1**	**3**
5A	A fair coin is tossed three times, and the random variable X is the number of heads in the first two tosses and the random variable Y is the number of heads in the last two tosses. What is the joint probability mass function of X and Y? What are the marginal probability mass functions of X and Y?	**4**	**4**	**1**	**3**
5B	Let $f(x,y) = k(x+y), 0 < x, y < 1$ be the joint PDF of the random vector (X,Y). Find the value of k. Hence compute $E(XY)$.	**3**	**4**	**1**	**3**
5C	Find the initial basic feasible solution of the following transportation problem using Vogel approximation method (VAM): I II III Demand A 1 2 6 7 B 0 4 2 12 C 3 1 5 11 Supply 10 10 10	**3**	**6**	**1**	**3**