



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



IV SEMESTER B.TECH (CSE/ I&CT/CC)

END SEMESTER EXAMINATION, MAY 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT-2206]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

| 1A. | It is suspected that a patient has one of the 3 diseases A_1 , A_2 , A_3 . Suppose that the population percentages suffering from these illness are in the ratio 2:1:1. The patient is given a test which turns out to be positive in 25% of cases of A_1 , 50% cases of A_2 , 90% cases of A_3 . Given that out of 3 tests taken by the patients, 2 are positive. Find the probability that he has illness A_1 . | 4 |
|-----|---|---|
| 1B. | In a bombing actions, there is 50% chance that any bomb will strike the target. Two direct hits are needed to destroy the target completely. How many bombs are required to be dropped to give a 99% chance or better for completely destroying target? | 3 |
| 1C. | Let X_i and Y_i , $\models 1,,25$ be two independent samples from normal distributions $N(0,16)$ and $N(1,9)$ respectively. Let \overline{X} and \overline{Y} denote the corresponding sample means. Compute $P(\overline{X} > \overline{Y})$. | 3 |
| 2A. | If x is a random variable taking values $0, 1, 2,$ with pdf $p(x) = ab^x$ where a and b are positive numbers such that $a + b = 1$. Find the m.g.f of X. If $E(x) = m_1$ and $E(x^2) = m_2$. Show that $m_2 = m_1 (2m_1 + 1)$. | 4 |
| 2B. | Let x_1, x_2, \ldots, x_n be a random sample of size n from $N(\theta_1, \theta_2), -\infty < \theta_1 < \infty$ and $\theta_2 > 0$. Then find MLE for θ_1 and θ_2 . | 3 |
| 2C. | Two independent observations X_1 and X_2 are made on a random variable X with pdf $f(x;\theta) = \theta x^{\theta-1}$, $0 < x < 1$, where $\theta > 0$. To test $H_0: \theta = 1$ against $H_1: \theta = 2$, it is decided to reject H_0 if $x_1x_2 > \frac{3}{4}$. Obtain the power of the test. | 3 |
| 3A. | Let X, Y be 2 independent random variables having pdf $f(x) = e^{-x}, 0 < x < \infty$ and $g(y) = 2e^{-2y}, 0 < y < \infty$. Find the pdf of $Z = X + Y$. | 4 |

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| IRED BY | _IFE | | -1 41 | | <u>T1</u> | 41 | | | - 1 - | | - 0 - | | |
| 3B. | the other till the last defective defective tube is obtained in the a). 2^{nd} test. b). 3^{rd} test c). 4^{th} test. | tube is for | a tu and. | Find | 1 th | e pi | s are obał | oility | that | the | alle las | t | 3 |
| 3C. | Suppose that the joint pdf of the is given by $f(x, y) = \begin{cases} x^2 + \frac{x}{2} \\ 0 \end{cases}$ Compute i) $P\{X > \frac{1}{2}\}$ ii) $P\{Y < 1\}$ | two dimensio $\frac{xy}{3}$; $0 < x < 0$; el X}. | nal 1, sew | rand 0 < vhet | om ` < y re | varial < 2 | ble (? | X,Y) |) | | | | 3 |
| 4A. | A computer in adding number Suppose that all rounding error (-0.5,0.5). If 1500 numbers are the total error exceeds 15? How the magnitude of the total error is | s rounds ea ors are inde added what w many numb s less than 10 | ch i pend is t pers with | numb lent he p may n pro | er and roba be bab | off t unif ability adde ility | o th ormly that ed to 0.9? | e no y di t the ogetho | eares stribu mag er ind | t int ited gnitua ordei | teger ove de o r tha | r f t | 4 |
| 4B. | A random sample of size 15 and $s^2 = 4.24$. Determine a 9 | from a norm 20% confiden | al c | listri | outio val | n N for | $\sqrt[3]{(\mu,\alpha)}$ | (5^2) | yields | 5 x = | = 3.2 | ; | 3 |
| 4C. | The distribution of blood groups is predicted to be 53%, 2% sample of 200 people are test belong to the respective groups. level of significance? | A, AB, B, and , 4%, and ed and 98, . Is the data | and 1 4 10, con | O an 1%, 12 sister | nong res , and | g the spect d 8(ith tl | pop ively.). P ne h <u>y</u> | oulatio To eople ypoth | on o veri e are nesis | far ifytl fou at | region nis, a nd to 0.05 | n a) ; | 3 |
| 5A. | Steel rods are manufactured to b are inside the limits 2.99 inches as oversize and 5% are reject normally distributed, find the st the proportion of rejects if perm 3.015 inches. | be 3 inches in and 3.01 inc cted as under andard devia hissible limits | n dia hes. ersize tion are | mete It is e. A of t wide | r bu obs ssum he c med | t the servening listrit betw | y are d tha that pution ween | e acc at 5% the n. H 2.98 | eptal 6 arc dian ence 85 in | ble if e rej neter cala | f they ected are culate and | / 1 e 1 | 4 |
| 5B. | With the usual notation, Prove t a,b,c,d are constants. | hat $\rho_{zw} = \pm \rho$ | XY | if Z | = a. | X+b | and | w = | = cY | +d v | where | e | 3 |
| 5C. | Suppose that X is uniformly dist find the pdf of Y, say $g(y)$. Als | tributed over o verify that | (-1, g(y)) | 1).) is a | Let 1 pdf | <i>Y</i> = | 4-2 | X^{2} . | Sket | ch Y | and | ł | 3 |