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IV SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: ENGINEERING MATHEMATICS [MAT 2201]
REVISED CREDIT SYSTEM
(21/04/2017)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:
- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	Solve the following equation by Frobenious series method; $$9x(1-x)\frac{d^2y}{dx^2} - 12\frac{dy}{dx} + 4y = 0$$	**4**
1B.	Fit a curve of the form $y = ab^x$ for the following data; x: 0 1 2 3 4 y: 3 21 147 1029 7023	**3**
1C.	A man tosses a coin and throws a die, beginning with coin. What is the probability that he will get a head before he gets a '5' or '6' on the die.	**3**
2A.	In a certain examination, the percentage of passes and distinctions were 40 and 9 respectively. Estimate the average marks obtained by the candidates, if the minimum pass and distinction marks being 45 and 75, respectively. Assume that marks are normally distributed.	**4**
2B.	In a partially destroyed laboratory record only the two lines of the regression of y on x and x on y are available and are respectively $7x - 16y + 9 = 0, 5y - 4x - 3 = 0$. Find $\bar{X}, \bar{Y}$, and correlation coefficient r.	**3**
2C.	Prove that $J_n''(x) = \frac{1}{4}[J_{n-2}(x) - 2J_n(x) + J_{n+2}(x)]$.	**3**
3A.	An incomplete distribution is given as follows. Given mean and median are 62.7 and 66. Determine the missing frequencies. (table below)	**4**

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	1	3	?	8	?	30	38

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3B.	The probability that a student passes a certain exam is 0.8, given that he has studied. The probability that he passes the exam, given that he has not studied is 0.2. Assume that the probability of the student studying for the exam is 0.6. Given that the student passes the exam, then what is the probability that he has studied?	**3**
3C.	If $X \sim N(\mu, \sigma^2)$, show that $E[(X-\mu)^{2n}] = 1.3.5 \dots (2n-1)\sigma^{2n}$.	**3**
4A.	If $X \sim N(\mu, \sigma^2)$, then show that random variable $Z = \frac{X-\mu}{\sigma} \sim N(0,1)$ and $Z^2 \sim \chi^2(1)$.	**4**
4B.	Let X be a continuous random variable with p.d.f given by $$f(x) = \begin{cases} ax & 0 \le x \le 1 \\ a & 1 \le x \le 2 \\ -ax + 3a & 2 < x \le 3 \\ 0 & \text{elsewhere} \end{cases}$$ Determine the constant a and obtain the c.d.f.	**3**
4C.	Let $\bar{X}$ be the mean of a random sample of size n from Normal distribution with mean μ and $\sigma^2 = 100$. Find n so that $\Pr\{\mu - 5 < \bar{X} < \mu + 5\} = 0.954$	**3**
5A.	Obtain the generating function of $J_n(x)$.	**4**
5B.	If X, Y, Z are uncorrelated random variable having same standard deviation. Find correlation coefficient between $X + Y$ and $Y + Z$.	**3**
5C.	Suppose that the joint pdf of two dimensional random variable (X, Y) is given by, $f(x,y) = \begin{cases} 6e^{-2x-3y} ; & x, y > 0 \\ 0 ; & elsewhere \end{cases}$ find a) $P(0 < X < 2, Y > 2)$ c) Are they independent?	**3**

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