Hall Ticket No | | | | | | | | | | | Question Paper Code: BCCB02

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - January, 2019

Regulation: IARE–R18

MATHEMATICAL METHODS IN ENGINEERING

Time: 3 Hours **(CAD/CAM)** **Max Marks: 70**

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

UNIT – I

1. (a) A random variable X has the following probability distribution shown in Table 1 **[7M]**

Table 1

x	-3	-2	-1	0	1	2	3
P(x)	k	0.1	k	0.2	2k	0.4	2k

Find the values of (i)k (ii)Mean (iii)variance.

(b) b) If X is normally distributed with mean 2 and variance 0. 1 then find P(|X-2| $\geq$ 0.01) **[7M]**

2. (a) A continuous random variable X has the probability density function $f(x) = k(1 - x^2)$ when 0<x<1,f(x)=0 otherwise Find(i) k (ii) Mean (iii)Variance **[7M]**

(b) A distributor of bean seeds determines from extensive tests that 5% of large batch of seeds will not germinate .He sells the seeds in packets of 200 and guarantees 90% germination .Determine the probability that a particular packet will violate the guarantee. **[7M]**

UNIT – II

3. (a) Briefly explain sample space, random variable and density function with examples. **[7M]**

(b) A random sample of 10 bags of pesticide are taken whose weights are 50,49,52,44,45,48,46,45,49,45(in kgs).Test whether the average packing can be taken to be 50kgs. **[7M]**

4. (a) Using random experiments how to establish that a coin is un-biased. **[7M]**

(b) A sample of 900 has a mean of 3.4cms and S.D. 2.61cms.Is this sample has been taken from large population of mean 3.25cm and S.D. 2.61cms.If the population is normal and its mean is unknown. Find 95% confidence interval for population. **[7M]**

UNIT – III

5. (a) Solve using Taylor's series method the equation $y' = 2y + 3e^x$ for $y(0.2)$ given y(0)=0 **[7M]**

   (b) Using Euler's method ,find an approximate value of y corresponding to x=1,given that $y' = y+x$, y(0)=1. **[7M]**

6. (a) Explain the method of approximation in Runge-Kutta numerical model. **[7M]**

   (b) Using Runge-Kutta method of fourth order solve for y at x=0.2 and x=01.4 from $y' = \frac{y^2-x^2}{y^2+x^2}$ given y(0)=1. **[7M]**

UNIT – IV

7. (a) Distinguish parabolic, hyperbolic and elliptic partial differential equations. **[7M]**

   (b) Solve $(mz - ny)\frac{\partial z}{\partial x} + (nx - lz)\frac{\partial z}{\partial y} = (ly - mx)$. **[7M]**

8. (a) Form the partial differential equation by eliminating arbitrary function from z=(x+y) $\Phi(x^2 - y^2)$. **[7M]**

   (b) Using the method of separation of variables solve $\frac{\partial u}{dx} = 2\frac{\partial u}{dt} + u$ where u(x,0)=$6e^{-x}$ **[7M]**

UNIT – V

9. (a) Define harmonic function and explain the significance of its conjugate. **[7M]**

   (b) In a two dimensional flow of a fluid the velocity potential $\Phi = x^2 - y^2$ Find the stream function ψ. **[7M]**

10. (a) Obtain the solution of wave equation using method of separation of variables. **[7M]**

    (b) Solve the equation $\frac{\partial u}{dt} = \frac{\partial^2 u}{dx^2}$ with boundary condition u(x,0)=3sin nx, u(0,t) and u(1,t)=0. **[7M]**

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