

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2015

Paper Code: ETMA203

Subject: Numerical Analysis &
Statistical Techniques

Time : 3 Hours

Maximum Marks : 75

Note: Attempt any five questions including Q.no.1 which is compulsory.
Select one question from each unit. Scientific calculator is allowed.

- Q1 (a) Two dice are tossed once. Find the probability of getting an even number on first die or a total of 8. (4)
- (b) A coin is tossed 600 times and the head turned up 290 times. Test the hypothesis that the coin is unbiased. (4)
- (c) Find the mean and variance of the Binomial distribution $B\left(4, \frac{1}{3}\right)$. (3)
- (d) Prove that the total area under the normal probability curve is unity. (5)
- (e) Prove that $\mu^2 \equiv 1 + \frac{1}{4}\sigma^2$. (4)
- ✓ Evaluate $\int_0^1 \frac{dx}{1+x}$ using Simpson's One-Third rule with $h=0.25$. (5)

UNIT-I

- Q2 (a) Find the expectation and variance of the random variable X whose p.d.f. is given by $f(x) = \begin{cases} 2e^{-2x} & , x > 0 \\ 0 & , \text{otherwise} \end{cases}$. (6)
- (b) Fit a curve $y=ab^x$ from the following data: (6.5)

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

- Q3 (a) In a large group of men, 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation. (6)
- (b) Fit a Poisson distribution to the following data and test the hypothesis that the data follow a Poisson distribution: (6.5)

x	0	1	2	3	4
y	109	65	22	3	1

UNIT-II

- Q4 (a) In a partially destroyed laboratory record of an analysis data, the following results are only legible: Variance of X=9, Regression equations: $8X - 10Y + 66 = 0$, $40X - 18Y = 214$. What were (i) the mean values of X and Y (ii) the correlation coefficients between X and Y and (iii) the standard deviation of Y? (6.5)

- (b) Two independent samples of sizes 7 and 9 have the following values:

Sample A	10	12	10	13	14	11	10		
Sample B	10	13	12	15	10	14	11	12	11

Test whether the difference between the means is significant. (6)

- Q5 (a) Discuss F-Test. (2.5)

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- (b) The following table gives the number of units of production per day turned out by four different types of machines:

Employee	Types of Machines			
	M ₁	M ₂	M ₃	M ₄
E ₁	40	36	45	30
E ₂	38	42	50	41
E ₃	36	30	48	35
E ₄	46	47	52	44

Using analysis of variance (i) test the hypothesis that the mean production is the same for the four machines and (ii) test the hypothesis that the employees do not differ with respect to mean productivity. (10)

UNIT-III

- Q6 (a) Using Newton-Raphson method, find the root of the equation $3x - \cos x = 1$. (6)

- (b) From the steam table we have the following data:

Temp in °C	140	150	160	170	180
Pressure in kg/m ³	3.685	4.854	6.303	8.076	10.225

Find the pressure at 142°C and 175°C. (6.5)

- Q7 (a) Determine $f(x)$ and $f(-2)$ from the following data: (6)

x	-4	-1	0	2	5
f	1245	33	5	9	1335

- (b) Solve the following system of simultaneous linear equations using Gauss-Seidal method upto four iterations: $9x + 4y + z = -17$, $x - 2y - 6z = 14$, $x + 6y = 4$. (6.5)

UNIT-IV

- Q8 (a) From the following data, find the maximum or minimum value of y : (6)

x	0.60	0.65	0.70	0.75
y	0.6221	0.6155	0.6138	0.6170

- (b) Evaluate $y(0.4)$ using Modified Euler's method from $y'' - y = e^x$, $y(0) = 0$ taking $h = 0.2$. (6.5)

- Q9 (a) A rocket is launched from the ground. Its acceleration f is noticed for first 80 seconds as given:

t	0	10	20	30	40	50	60	70	80
f	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Estimate the velocity of the rocket at $t = 80$ sec. using Simpson's Three-Eighth rule. (6)

- (b) Using Runge-Kutta method of order 4, solve $\frac{dy}{dx} = \ln(x + y)$, $y(0) = 2$ for $x = 0.2$ in two steps. (6.5)

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