THE ASSAM ROYAL GLOBAL UNIVERSITY GUWAHATI

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SUBJECT CODE :MAT024101

Roll No. of candidate | | | | | | | | | | |

2017

End Semester M.Tech.(Mechanical Engineering) Examination

1st Semester

ADVANCED ENGINEERING MATHEMATICS

Full Marks- 70 Pass marks:21 Time- 3 hours

The figures in the margin indicate full marks for the questions

PART – A

1. Answer all questions: $[\mathbf{16 \times 1 = 16}]$

(a) What is the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 7 \\ 0 & 0 & 6 \end{bmatrix}$?

(b) What do you mean by ill- condition system of linear equations?

(c) Does a system of homogeneous linear equations inconsistent? Justify your answer.

(d) Is the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 2 & 4 & 6 \end{bmatrix}$ invertible? Justify your answer.

(e) What is interpolation?

(f) Find $f(2)$ if $f(0) = 1,\ f(1) = -1,\ f(3) = 0.$

(g) For f(x) $= x$, find $f(a, b, c)$.

(h) Give the error of Euler's method of solving differential equation.

(i) If A and B are independent events with probabilities $\frac{1}{2}$ and $\frac{1}{5}$ respectively, evaluate $P(A\bar{B})$.

(j) Define Null Hypothesis.

(k) Write one application of t- test.

(l) If X follows poisson distribution with mean 2, evaluate $P(X \geq 1)$.

(m) What is $\Delta^2 y_x$, $y_x = a + bx$, a and b are constants.

(n) Which value is minimized by least square method?

(o) Which curve may be taken as the best fit if $\Delta^2 y_x$ = constant?

(p) Write one important use of fitting a curve for given data set.

PART – B

2. Answer the following:

(a) Reduce the matrix $\begin{bmatrix} 3 & 2 & 1 \\ 1 & 4 & 5 \\ 5 & 6 & 2 \end{bmatrix}$ to the normal form. [5]

(b) Using Newton's divided difference formula find the missing value from the table: [5]

x	1	2	4	5	6
y	14	15	5	---	9

(c) A bag contains 10 gold and 8 silver coins. Two Successive drawings of 4 coins are made such that: (i) coins are replaced before the second trial, (ii) the coins are not replaced before the second trial. Find the probability that the first drawing will give 4 gold and second 4 silver coins. [4]

PART – C

3. Answer the following:

(a) Find the solution of the following system of linear equations by LU decomposition method

$$2x - 3y + 10z = 3, \quad -x + 4y + 2z = 20, \quad 5x + 2y + z = -12$$ [10]

$$OR$$

(b) Solve the following system of linear equations by Gauss elimination method

$$10x - 7y + 3z + 5w = 6, \qquad -6x + 8y - z - 4w = 5,$$
$$3x + y + 4z + 11w = 2, \qquad 5x - 9y - 2z + 4w = 7.$$ [10]

4. **Answer the following:**

(a) Use Runge-Kutta method of fourth order to find $y(0.1)$, (0.2) ;
given that $\frac{dy}{dx} = y - x, \ \ y(0) = 2.$ [10]

$$OR$$

(b) (i) Given $\sin 45^0 = 0.7071$, $\sin 50^0 = 0.7660$, $\sin 55^0 = 0.8192$, $\sin 60^0 = 0.8660$, find $\sin 52^0$. [5]

(ii) Using Euler's method solve $\frac{dy}{dx} = x + \ y + xy,$ at $x = 0.1$, given $y(0) = 1, h = 0.025.$ [5]

5. **Answer the following:**

(a) In a group of 2000 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**.** [10]

$$OR$$

(b) (i) In answering a question on a multiple choice test, an examinee either knows the answer (with probability p) or he guesses the answer (with probability 1-p). Assume that the probability of answering a question correctly is unity for an examinee who knows the answer and 1/5 for the examinee who guesses, where 5 is the number of multiple choice alternatives. Supposing an examinee answers a question correctly,What is the probability that he really knows the answer? [5]

(ii) What is Binomial distribution? Derive mean of the Binomial distribution. [5]

6. **Answer the following:**

(a) Fit an exponential curve of the form $Y = ab^x$ to the following data:

X:	1	2	3	4	5	6	7	8
Y:	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

[10]

$$OR$$

(b) Explain the method of fitting of exponential curves (i) $Y = ab^x$ and (ii) $Y = ae^{bx}$. [10]