

2022

**APPLIED MATHEMATICS WITH OCEANOLOGY AND
COMPUTER PROGRAMMING**

[P.G.]

(M.Sc. Fourth Semester End Examination-2022)

PAPER-MTM 405 (B)

Full Marks: 25

Time: 01 Hr

*The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as
far as practicable
Illustrate the answers wherever necessary*

UNIT - I

[OPERATION RESEARCH MODELLING]

1. Answer any two questions from the following: **2x2= 4**
- a) What is Hazard rate? If the failure rate λ , than what will be the hazard rate?
 - b) What do you mean by memory less channel and channel matrix?
 - c) Show that entropy function is continuous.
 - d) What is encoding? Give it's the main objective.

Answer any two questions from the following: **2x8 = 16**

2. a) A source memory has six characters with the following probability of transmittion

(2)

A	B	C	D	E	F
1/3	1/4	1/8	1/8	1/12	1/12

Devise the Shannon-Fano encoding procedure to obtain uniquely decodable code to the above message. What is average length, efficiency and redundancy of the code that you obtained?

b) Let p_1, p_2, \dots, p_m and q_1, q_2, \dots, q_m be arbitrary non-negative

numbers with $\sum_{i=1}^m p_i = \sum_{j=1}^m q_j$

Prove that $\sum_{i=1}^m p_i \log p_i \leq -\sum_{i=1}^m p_i \log q_i$ with equality occurs iff

$p_i = q_i$ for all i 6+2

3. a) Obtain the necessary condition for the functional

$I[y(x)] = \int_{x_1}^{x_2} f(x, y, y', y'') dx$ to be extremum satisfying the

boundary conditions $y(x_1) = y_1, y(x_2) = y_2, y'(x_1) = y_1'$ and $y'(x_2) = y_2'$

b) Find the curve passing through the points (x_1, y_1) and (x_2, y_2) which rotated about the x-axis gives a minimum surface area.

5+3

4. a) Show that the reliability of an item can be expressed as

$\exp\left[-\int_0^t \lambda(t) dt\right]$ where $\lambda(t)$ is the failure rate of an item

(3)

b) An electronic device has failure rate of 500 failures per 10^6 hours. One identical stand by unit added to increase the reliability of the basic device. The operating time is 1000 hours. The failure rate of the sensing and switching element is 0.97. What is the system reliability? What will be the system reliability if the sensing and switching element is 100% reliable? 4+4

Internal Assessment - 05
