PG/IVS/MTM-405/14

M.Sc. 4th Semester Examination, 2014

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

(*Operational Research Modelling* - II/*OM*)

PAPER – MTM - 405

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate marks

(*Operational Research Modelling* - II)

[*Marks* : 25]

Time : 1 hour

Answer **Q.No.1** and any **two** from the rest

1. Answer any *two* questions : 2 × 2

(*a*) Define series and parallel arrangements of reliability of a machinery system with proper examples.

(*b*) Discuss the sequencing routes for *n* jobs in *m* machines.

(*c*) Define encoding and memoryless channel in information theory.

2. (*a*) Derive the process of n jobs through two machines in minimum amount of time.

(*b*) Find the minimum elapsed time and ideal time for both Machine 1 and Machine 2 for 6 jobs as follows : 4 + 4

	Jobs					
Machine	J_1	J_2	J_3	J_4	J_5	J_6
1	1	5	8	7	3	3
2	5	6	5	2	2	10

3. Define entropy function in information theory and hence show that the entropy of the following probability distribution is $2-\left(\frac{1}{2}\right)^{n-2}$

Events : x_1 x_2.... x_i.... x_{n-1} x_n

Probabilities : $\frac{1}{2}$ $\frac{1}{2^2}$ ... $\frac{1}{2^i}$ .... $\frac{1}{2^{n-1}}$ $\frac{1}{2^{n-1}}$

2 + 6

4. (*a*) Assume that the reliability of each individual component is p. Which design described below will you prefer and why ?

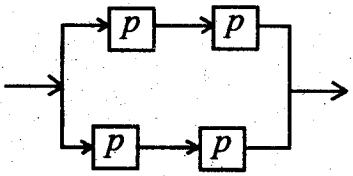

Figure 1.

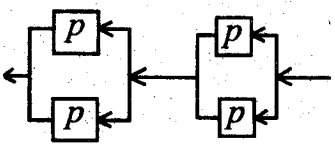

Figure 2.

(*b*) State Pontrygin's minimum principle.

(*c*) Find the stationary path $x = x(t)$ for the functional $J = \frac{1}{2}\int_0^2 (\ddot{x})^2\, dt$ subject to the boundary conditions $x(0) = 1$, $\dot{x}(0) = 1$, $x(2) = 0$, $\dot{x}(2) = 0$. 3 + 4 + 1

[*Internal Assessment* : 5 Marks]

(OM)

[*Marks* : 25]

Time : 1 hour

Answer **Q.No.1** and any **two** from the rest

1. Answer any *one* questions : 2×1

   (*a*) What is the concept of CISK ?

   (*b*) What is the cocept of frontogenesis and frontolysis ?

2. Define frontal surface and front. Show that the slope of a frontal surface depends on the difference surface of temperatures and velocities in two air masses. What is Kinematic boundary condition ? Show that this condition reduces to an equality of the wind components perpendicular to the front. $2 + 5 + 1 + 1$

3. (*a*) Derive the expression of frictional force per unit mass resulting from eddy viscosity in the atmosphere. 6

   (*b*) Derive the angle between the two arms of the 'V' made by the isobars at a front. 3

4. (*a*) Explain perturbation technique. Derive the perturbation equations for a homogenous in compressible fluid. $1 + 6$

   (*b*) Write down a short note on 'Storm Surge. 2

[*Internal Assessment* : 5 Marks]