M.Sc. 4th Semester Examination, 2012

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER — MTM- 405

(*Operational Research Modelling* - II / OM)

Full Marks : 50

Time : 2 hours

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

The figures in the right hand margin indicate marks

(*Operational Research Modelling* - II)

[*Marks* : 25]

Time : 1 hour

1. Answer any *two* questions :　　　　2 × 2

   (*a*) What do you mean by total elapsed time by a machine ?

   (*b*) Distinguish between Serial Arrangement and Parallel Arrangement in the reliability of a system.

(c) Explain impulse control, feedback control and transversality condition in an optimal control problem.

2. *(a)* Show that the geodesic on a sphere of radius *a* is its great circle.

   (b) Derive the use of reliability to make the design of a system. $4 + 4$

3. *(a)* A source memory has six characters with the following probabilities of transmission :

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

   Derive the Shanon-Fano encoding procedure to obtain a uniquely decodable code to the above message ensemble. What is the average length, efficiency and redundancy of the code that you obtain ?

   (b) Let there be *n* events $E_1, E_2, ..., E_n$ with probabilities $p_1, p_2, ..., p_n$ respectively of their occurences so that $p_1 + p_2 + ... + p_n = 1$. Prove

(Continued)

that the entropy H associated with the above probability distribution is maximum when the events are equally likely to occur and $H_{max} = \log n$.

4 + 4

4. (a) Deduce the procedure to process n jobs through m machines.

(b) Find the extremising curve for the integral

$$I = \int_0^1 \left(y'^2 - 4xyy' - y^2\right) dx$$

where $y(0) = 1$ and $y(1) = \frac{1}{2}\left(e + \frac{1}{e}\right)$.

4 + 4

[*Internal Assessment* : 5 Marks]

(*OM*)

[*Marks* : 25]

Time : 1 hour

1. Answer any *one* question :

2 × 1

(a) Explain the classification of fronts.

(b) What is CISK ?

2. (a) Show that the isobars are always V-shaped at a front with lower pressures within the V and develop a formula for the angle between the two arms of the V made by the isobars at a front.

   (b) Show that in a geostrophic wind field, an ideal front is necessarily stationary. $7 + 2$

3. (a) Derive the equation to determine the diffusion of water vapor through the atmosphere by turbulent mixing processes.

   (b) What is the difference between stream line and turbulent motion in the atmosphere ? $7 + 2$

4. Discuss the frontagenesis and frontolysis in a deformation fied and also give an example of a specific contraction field in the earth's atmosphere. $6 + 3$

[*Internal Assessment* : 5 Marks]

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