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PG CBCS

M.SC. Semester-IV Examination, 2021

(Mathematics)

PAPER: MTM-405B

(**OPERATIONAL RESEARCH MODELLING - II**)

Full Marks: 20 **Time: 1 Hour**

Answer any <u>TWO</u> questions from the following: **2×10=20**

1. (a). What do you mean by the term 'reliability' of an item? Derive the general formula to computing reliability of an item.

   (b).Three generators, one with a capacity of 100 kw and the other two with a capacity of 50 kw each are connected in parallel. Draw the reliability logic diagram if the required load is: (i) 100 kw (ii) 150 kw.Determine the reliability of both the arrangements if the reliability of each generator is 0.95. (2+4)+4

2. (a). The two finite probability schemes are given by $(p_1,\ p_2,\ p_3,\ldots,p_n)$ and $(q_1,\ q_2,\ q_3,\ldots,q_n)$, with $\sum_{i=1}^{n} p_i=\sum_{i=1}^{n} q_i$, then show that $-\sum_{i=1}^{n} p_i log p_i \leq -\sum_{i=1}^{n} q_i\ log q_i$ with inequality holds if and only if $p_i=q_i$ for all i.

   (b). Find the curve along which arc length joining points (1,1) and (4,5) is extremum. 5+5

3. (a). State Pontrygin's maximum principle in connection with optimal control problem.

   (b). Find the extremal of the functional $\int_0^{\frac{\pi}{2}}(y'^2 - y^2 + 2xy)dx$ that satisfy the boundary conditions $y(0) = 0, y\left(\frac{\pi}{2}\right) = 0.$ 2+8

4. (a).Define entropy function.

   (b). Establish the following results for two-dimensional discrete probability distribution

   (i) $H(X,Y) = H(X) + H(Y)$ if and only if X and Y are independent.

   (ii) $H(X,Y) = H(X|Y) + H(Y) = H(Y|X) + H(X).$

   (iii) $H(X) \geq H(X|Y);\ \ H(Y) \geq H(Y|X).$ 1+9

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