Total No. of Questions : 10]

SEAT No. :

P4449

[Total No. of Pages :3

[5255] - 115

M.E. (Mechanical) (Design Engg.)

RELIABILITY ENGINEERING

(2008 Course) (Elective - III) (Semester - II) (502211 (A))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define Reliability. Calculate the reliability for the system shown in Fig. 1. **[8]**

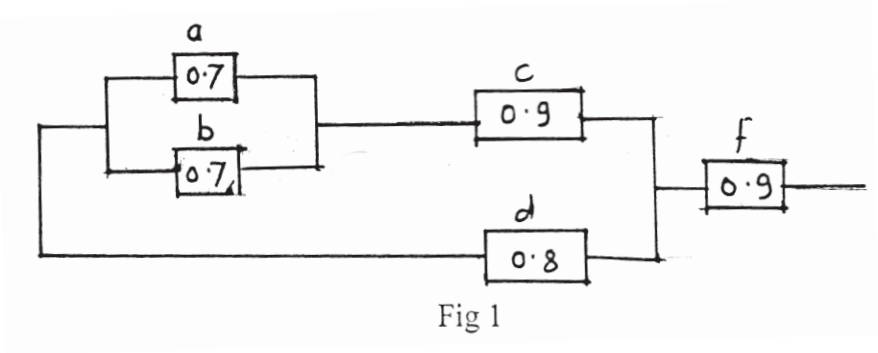

Fig 1

b) Explain MTBF & MTTF. **[8]**

Q2) a) Explain failure density and failure rate. Describe the main features of bathtub failure rate curve, explain each region with its curve. **[8]**

b) How the probability density and probability distribution functions are Related? What is the significance of probability distribution function. **[8]**

[redacted]

P.T.O.

Q3) a) What is meant by redundancy in system? Explain the significance difference between active partially active & passive redundancy. **[6]**

b) A hard plastic box designed to house a multi meter is tested for its impact strength by dropping it from a fixed height and observing for any damage. A total of 500 boxes were tested and the results are as tabulated here: **[10]**

No. of Drops	10	12	13	15	17	20	21	23	25
No. of boxes damaged	30	50	30	110	90	130	17	35	8

Q4) a) Explain the difference between predictive preventive maintenance and periodic preventive maintenance. **[8]**

b) Explain FMECA with its sheet. **[8]**

Q5) Write the short note on following (Any Three) **[18]**

a) Risk Priority Number (RPN)

b) Safety factor and safety margin.

c) Reliability Engineering and Robust Design.

d) Reliability Engineering Tools.

e) Safety factor and safety margin.

SECTION - II

Q6) a) Explain the designing for maintainability. **[8]**

b) A system consists of three units connected in series, with reliabilities R1 = 0.70, R2 = 0.80, and R3 = 0.90. It is desired that the reliability of the system be 0.65. How should this be apportioned among the three units. **[8]**

Q7) a) Explain ARINC method of reliability allocation. **[8]**

b) For the logic diagram shown in fig.2 construct the fault tree. **[8]**

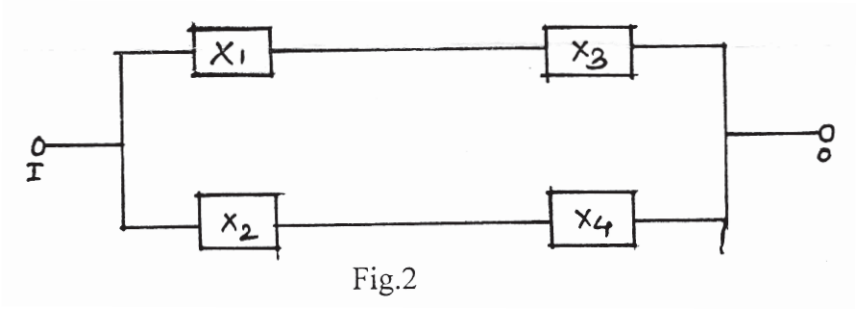

Fig.2

Q8) a) Discuss the method of obtaining criticality of component or a sub system using RPN. **[6]**

b) For the system represented by fig 3, calculate the reliability using the tie-set and Cut-set methods. **[10]**

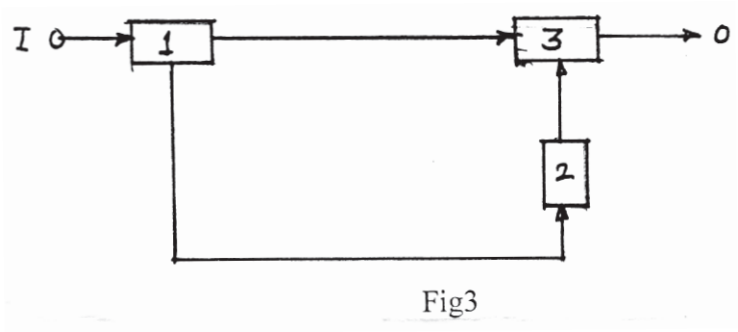

Fig3

Q9) a) What is 'Redundancy' in a system? Explain the active and stand by redundant system. **[8]**

b) Explain Tie set and cut set method of reliability evaluation. **[8]**

Q10) Write the short note on following (Any Three). **[18]**

a) AGREE method of reliability allocation.

b) Reliability of complex system.

c) Ishikawa diagram.

d) Markov Model.

e) Methods of finding reliability of complex system.

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