B.Tech. SEM -VI Mechanical 2014 Course (CBCS) : SUMMER - 2019

SUBJECT : ELECTIVE – I : RELIABILITY ENGINEERING

Day : Friday
Date : 31/05/2019

Time : 02.30 PM TO 05.30 PM
Max. Marks : 60

S-2019-2762

N. B. :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
3) Assume suitable data, if necessary.

Q. 1 **a)** Explain importance of Reliability with example. **(06)**

b) Define failure density, MTBF. **(04)**

OR

a) Define failure rate and Hazard rate. **(04)**

b) Write short note on Bath tub curve. **(06)**

Q. 2 **a)** Explain total probability theorem **(06)**

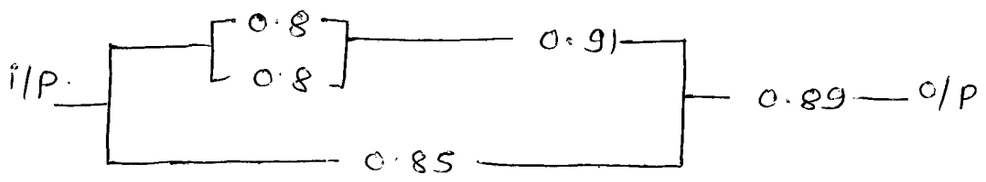
b) If probability of item failing is 0.001. What is probability of 3 items failing out of 1500 population? **(04)**

OR

a) Explain normal distribution in detail. **(06)**

b) For mechanical component follows weibull distribution with $\beta = 2.5$, $\eta = 3000$ and $F = 1600$. Find reliability of component. **(04)**

Q. 3 **a)** Find reliability of following system: **(06)**



b) Explain unit redundancy. **(04)**

OR

a) Write short note on Improvement of components reliability. **(06)**

b) Explain element redundancy. **(04)**

P. T. O.

Q. 4 **a)** Explain equal apportionment and ARINC technique to find reliability. **(06)**

b) Following data observe in plant: **(04)**
MTBF = 20 hr, MTBM = 7 Hr, MDT = 4.5 Hr, MTTR = 3 Hr
Find:
i) Inherent availability
ii) Operational availability

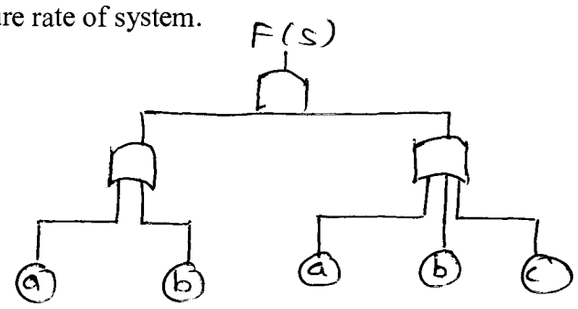
OR

a) Explain availability with its types **(04)**

b) A system of 3 element having failure rates 0.007, 0.003 and 0.001 per hr. respectively. Assume mission time 20 hr and system reliability 0.90. Find failure rate and reliability of each sub system. **(06)**

Q. 5 **a)** Discuss advantages of FMEA diagram. **(04)**

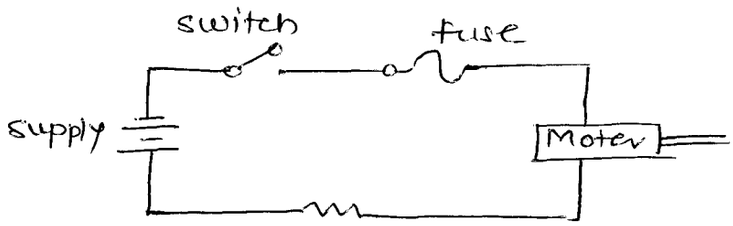
b) Fig shows fault tree diagram, failure rate of each element are a = 0.025, b = 0.01, c= 0.005. Find failure rate of system. **(06)**



OR

a) Explain measures of maintainability. **(04)**

b) Draw fault tree for motor circuit for given fig. top event fig, fault tree analysis is simply failure of motor to operate. **(06)**



Q. 6 **a)** Write shot note on Accelerated Life Testing (ALT). **(06)**

b) Explain causes of failures of engineering components and systems. **(04)**

OR

a) Write short note on Highly Accelerated Life Testing (HALT). **(06)**

b) Explain safety factor and safety margin. **(04)**

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