Acta Ciencia Indica, Vol. XLIII M, No. 2, 101 (2017)

STUDY OF SERVICE CYCLE IN MULTIPLE VACTION MODEL WITH EXHAUSTIVE SERVICE

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RECEIVED : 25 July, 2017

In this present paper, we study the service cycle in multiple vacation model with exhaustive service. A service period, whose length (measured in slots) is denoted by S_v, is defined as a time interval that is started at the end of a vacation and is terminated at the beginning of the next vacation. If there are no messages present in the system at the end of a vacation the lenth of the service period is zero.

KEYWORDS : Service cycle, Period, Vacation, System state, Slots.

SERVICE CYCLE

The PGF S_v (u) for S_v is given by

$$S_v(u) = V\{\Lambda[\Theta(u)]\} \qquad \dots (1.1.1)$$

From (1.1.1), we have,

$$S_v(u) = \frac{\rho\, E[V]}{1-\rho} \qquad \dots (1.1.2)$$

$$E[S_c^2] = \frac{\rho^2 E[V^2]}{(\mathbf{1}-\boldsymbol{\rho})^2} + \frac{\left(\boldsymbol{\lambda b}^{(2)} + \boldsymbol{\lambda}^{(2)}\boldsymbol{b}^{\mathbf{2}} - \rho^{\mathbf{2}}\right) E[V]}{(\mathbf{1}-\boldsymbol{\rho})^3} \qquad \dots (1.1.3)$$

A service cycle, whose length (measured in slots) is denoted by *C*, consists of a service period and the following vacation. In other words, a service cycle is a time interval that is started at the end of a vacation and is terminated at the end of the next vacation. A service cycle is also a regeneration cycle of the system state. Since the length of a vacation is independent of the length of the preceding service period, the PGF *C* (*u*) for *C* is simply given by

$$C(u) = S_v(u)\, V(u) \qquad \dots (1.1.4)$$

Which gives

$$E[C] = E[S_v] + E[V] = \frac{E[V]}{1-\rho} \qquad \dots (1.1.5)$$

$$E[C^2] = \frac{2\rho(E[V]^2]}{1-\rho} + \frac{(1-2\rho+2\rho^2)E[V]^2}{(\mathbf{1}-\boldsymbol{\rho})^2} + \frac{\left(\boldsymbol{\lambda b}^{(2)} + \boldsymbol{\lambda}^{(2)}\boldsymbol{b}^{(2)} - \rho^{\mathbf{2}}\right)E[V]}{(\mathbf{1}-\boldsymbol{\rho})^3} \qquad \dots (1.16)$$

Note that

$$\frac{E[S_v]}{E[C]} = \rho; \qquad \frac{E[V]}{E[C]} = 1 - \rho \qquad \text{... (1.1.7)}$$

Here, the service cycle *C* is difference from a time interval, whose length (measured in slots) is denoted by *C*; that is started at the beginning of a vacation and is terminated at the beginning of the next vacation. The PGF *C* (*U*) for *C* is given by

$$C'(u) = V\{U\Lambda[\,\Theta\,(u)]\} \qquad \text{... (1.1.8)}$$

From (1.1.8), we have,

$$E[C'] = \frac{E[V]}{\rho} \qquad \text{... (1.1.9)}$$

However, we also have,

$$E[C^2] = \frac{E\,[V]^2}{(\mathbf{1}-\boldsymbol{\rho})^2} + \frac{\left(\boldsymbol{\lambda b}^{(2)} + \boldsymbol{\lambda}^{(2)}\boldsymbol{b}^{(2)} - \rho^{\mathbf{2}}\right)E[V]}{(\mathbf{1}-\boldsymbol{\rho})^3} \qquad \text{... (1.1.10)}$$

Which is a different from the expression obtained in (1.1.6). Note that each interval C' is independent and a regeneration cycle of the system state .

Further, similiarly we have the joint PGF *C* (*u*, *u*) for two successive service cycles in an exhaustive service system with multiple vacations is given by

$$X\,(u, u) = S_v\,(u)\,V\{U\ \Lambda\,[\Theta\,(u')]\}\ V\,(u) \qquad \text{... (1.1.11)}$$

and the covariance o two successive service cycles is given by

$$\frac{\rho\ \ V\,ar\,[V\,]}{1-\ \rho} \qquad \text{... (1.1.12)}$$

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