Experiment 8

Aim: To find parameters and performance of long transmission line using MATLAB.

Develop program in MATLAB to determine

Q1. A 50 Hz transmission line 300 km long has a total series impedance of 40 + j125 ohms and a total shunt admittance of 10^{-3} mho. The receiving-end load is 50 MW at 220 kV with 0.8 lagging power factor. Find
a) the sending-end voltage, current, power and power factor
b) voltage regulation and efficiency
using:

(i) Short line approximation,
(ii) Nominal-pi method,
(iii) Exact transmission line equation,
(iv) Approximation Comment on the results obtained.

Comment on the results obtained.

Apparatus Required: MATLAB 2020a (software used)

MATLAB Code:

```
clc
clear all
f=50;
Z=40+j*125;
Y=j*10^(-3);
P=50;
V=input('enter the phase voltage:');
Vr=V/sqrt(3)+0*j;
l=300*(10)^3;
pf=0.8;
sr=P+i*P*tan(acos(pf));%for ir angle
ir=conj(sr)/(3*conj(Vr))
n=input('method to be used : 1.short line 2.pi 3.exact 4.appro');
switch n
   case 1.
      A=1;B=Z;C=0;D=A;
   case 2.
      A=1+(Y*Z)/2;B=Z;C=Y*(1+(Y*Z)/4);D=A;
   case 3.
      Zc=sqrt(Z/Y);
      gamma=sqrt(Z*Y);
      A=cosh(gamma);
      B=(Zc)*sinh(gamma);
      C=(1/Zc)*sinh(gamma);
      D=cosh(gamma);
   case 4.
      A=(1+(Y*Z)/2);
      B=Z*(1+(Y*Z)/6);
```

```
    C=Y*(1+(Y*Z)/6);
    D=A;

end
ABCD_1=[A B;C D];
p=ABCD_1*[Vr;ir];
Vs=p(1)
is=p(2)
sendingpf=angle(Vs)-angle(is);
pf=cos(sendingpf);
vnoload=(Vs/A);
VR=(((vnoload)-Vr)/Vr)*100
pss=3*Vs*conj(is)
efficiency=100*(P/real(pss))
```

Output:

1. Short line method
   vs = 1.4457e+02 + 1.2466e+01i
   is = 0.1312 - 0.0984i
   pf = 0.7455
   pss = 53.2283 +47.5885i
   VR = 13.8171 + 9.8140i
   ps = 0.9393

2. Pi method
   vs = 1.3663e+02 + 1.5006e+01i
   is = 0.1237 + 0.0334i
   pf = 0.9881
   pss = 52.2123 - 8.1254i
   VR = 14.9548 +10.1493i
   ps = 0.9576

3. Exact method
   vs = 1.2550e+02 + 3.3331e+00i
   is = 0.1086 - 0.0952i
   pf = 0.7342
   pss = 39.9280 +36.9241i
   VR = -1.3711 + 2.7427i
   ps = 1.2523

4. Approx method
   vs = 1.3618e+02 + 1.4863e+01i
   is = 0.1241 + 0.0347i
   pf = 0.9866
   pss = 52.2634 - 8.6550i
   VR = 14.5756 +10.0375i
   ps = 0.9567

Conclusion: