

Appendix C

C.1. MATLAB codes of Empirical Methods

```
%Standing correlation
a=0.00091*T-0.0125*API;
b=(RS./SGGAS).^0.83;
BpS=18.2*(b.*(10.^a)-1.4);
%Hanafy correlation
BpH=3.205*RS+157.27;
%Glaso's correlation
A=0.816;
B=0.172;
C=-0.989;
D=((RS./SGGAS).^A).*(T.^B).*(API.^C);
E=1.7669+1.7447*log10(D)-0.30218*(log10(D).^2);
BpG=10.^E;
%Marhoun's correlation
a1=5.38088e-3;
b1=0.715082;
c1=-1.87784;
d1=3.1437;
e1=1.32657;
SGO=141.5./(API+131.5);
BpM=(a1*RS.^b1).*(SGGAS.^c1).*(SGO.^d1).*((T+460).^e1);
%The Petrosky-Farshad Correlation
X=(7.916*10^-4)*(API.^1.541)-(4.561*10^-5)*(T.^1.3911);
BpP=((112.727*RS.^0.577421)/((SGGAS.^0.8439).*10.^X))-1391.051;
%The Vasquez-Beggs Correlation
API1=API(API<=30);
SGGAS1=SGGAS(API<=30);
Bp1=Bp(API<=30);
RS1=RS(API<=30);
T1=T(API<=30);
BpV1=(RS1./(0.0362*SGGAS1.*exp((25.7240*API1)./(T1+459.67))))^(1/1.0937);
API2=API(API>30);
SGGAS2=SGGAS(API>30);
Bp2=Bp(API>30);
RS2=RS(API>30);
T2=T(API>30);
BpV2=(RS2./(0.0178*SGGAS2.*exp((23.9310*API2)./(T2+459.67))))^(1/1.187);
Bp_merge=vertcat(Bp1,Bp2);
BpV_merge=vertcat(BpV1,BpV2);
% New Developed Model using PNN
FF=0.00198116772535883*RS.^2-0.285913939846628*RS-...
(6.10970951151487E-07)*RS.^3;
CC=(FF./API.^3)-((1.55006348031057E-05)*RS.^2)./API.^2+3.45650186495866E-05;
EE=13.1235277701562*RS-0.0523475318169027*RS.^2;
DD=0.0758273768854742*RS.^2-25.9863039463805*RS+3.47631179777619E-
05*RS.^3;
BB=(DD./SGGAS.^3)+(EE./SGGAS.^2)-23.6379866497829;
AA=(25.3166493008985./RS.^3)-(0.0572162929908855./RS.^2)-...
((5.77327362576809E-05)./RS)+3.42941476268605E-08;
BpPNN=(AA.*RS.^4)+(BB.*SGGAS.^4)+(CC.*API.^4)+99.9140435836107;
```