R1:
```
conf t
int g0/0
Desc conn to R2
ip add 10.12.1.1 255.255.255.0
no shut
int g1/0
Desc conn to R3
ip add 10.13.1.1 255.255.255.0
no sh
int lo0
ip add 1.1.1.1 255.255.255.0
exit

router  ospf 1
router-id 1.1.1.1
net 0.0.0.0 255.255.255.255 area 0
exit
```

R2:ABR-1
```
conf t
int g0/0
Desc conn to R1 in Area 0
ip add 10.12.1.2 255.255.255.0
no shut
int g1/0
Desc conn to R4 in Area 1
ip add 10.24.1.2 255.255.255.0
no shut
exit

router ospf 1
router-id 2.2.2.2
net 10.12.1.2 0.0.0.0 area 0
net 10.24.1.2 0.0.0.0 area 1
exit
```

R3:ABR-2
```
conf t
int g0/0
Desc conn to R1 in Area 0
ip add 10.13.1.3 255.255.255.0
no shut
int g1/0
Desc conn to R5 in Area 1
ip add 10.35.1.3 255.255.255.0
no shut
exit

router ospf 1
router-id 3.3.3.3
exit

int g0/0
ip ospf 1 area 0
int g1/0
ip ospf 1 area 1
exit
```

```
R4: ASBR-1
conf t
int g0/0
Desc conn to R2 in area 1
ip add 10.24.1.4 255.255.255.0
no sh
int g1/0
Desc conn to Eigrp NW
ip add 172.46.1.4 255.255.255.0
no sh
exit

router eigrp 100
net 172.46.1.4 0.0.0.0
exit

router ospf 1
router-id 4.4.4.4
net 10.24.1.4 0.0.0.0 area 1
redistribute eigrp 100 subnets metric-type 1


R5
conf t
int g0/0
Desc conn to R3 in area 1
ip add 10.35.1.5 255.255.255.0
no sh
int g1/0
Desc conn to Eigrp NW
ip add 172.56.1.5 255.255.255.0
no sh
exit

router eigrp 100
net 172.56.1.5 0.0.0.0
Redistribute ospf 1 metric 1 1 1 1 1
exit

router ospf 1
router-id 5.5.5.5
net 10.35.1.5 0.0.0.0 area 1
redistribute eigrp 100 subnets metric-type 2

R6:Eigrp
conf t
int g0/0
ip add 172.46.1.6 255.255.255.0
no sh
int g1/0
ip add 172.56.1.6 255.255.255.0
no sh
int lo0
ip add 200.0.0.1 255.255.255.0
exit

router eigrp 100
net 0.0.0.0
```

```
exit
==================================
Case 1
Both O E1/O E2  same Cost
O E1 is installed in RIB

Cost =Fwd metric+ Seed metric
Fwd metric=Cost to ASBR
Seed metric =Cost from  ASBR to external NW


R1------R2
FWD 3 + Seed 20   =23    O E1
R1----R3
FWD 2 + Seed 20   =22    O E2

R1
O E1  200.0.0.0/24 [110/23] via 10.12.1.2, 00:00:46, GigabitEthernet0/0

================================================
Case 2 : Both are  O E1 routes

R1------R2
FWD 3 + Seed 20   =23    O E1
R1----R3
FWD 2 + Seed 20   =22    O E1   --> installed in RIB

Diff Seed metric but same cost
R1------R2
FWD 3 + Seed 19   =22    O E1
R1----R3
FWD 2 + Seed 20   =22    O E1   --> installed in RIB

R4:
router ospf 1
redistribute eigrp 100 subnets metric-type 1 metric 19
exit

O E1  200.0.0.0/24 [110/22] via 10.13.1.3, 00:02:25, GigabitEthernet1/0
                              [110/22] via 10.12.1.2, 00:00:26, GigabitEthernet0/0


============================================================
OE2
SEED metric Same
O E2  200.0.0.0/24 [110/20] via 10.13.1.3, 00:00:18, GigabitEthernet1/0
                               [110/20] via 10.12.1.2, 00:00:18,
GigabitEthernet0/0

Change Seed metric on R4

router ospf 1
redistribute eigrp 100 subnets metric 19
exit

O E2  200.0.0.0/24 [110/19] via 10.12.1.2, 00:00:05, GigabitEthernet0/0


Seed Metric Diff
```

```
R1:
I 4.4.4.4 [11] via 10.12.1.2, GigabitEthernet0/0, ASBR, Area 0, SPF 5
I 5.5.5.5 [2] via 10.13.1.3, GigabitEthernet1/0, ASBR, Area 0, SPF 5

R4
Seed metric 19 FWD  11
R5
Seed metric 20 FWD  2

O E2  200.0.0.0/24 [110/19] via 10.12.1.2, 00:00:05, GigabitEthernet0/0

Seed Metric same /Fwd metric Diff

R4
Seed metric 20 FWD  11
R5
Seed metric 20 FWD  2

O E2  200.0.0.0/24 [110/20] via 10.13.1.3, 00:00:11, GigabitEthernet1/0

O E1 path cost

OE2
lower seed metric
Same seed metric ,Lower FWD metric
Same seed metric,Same FWD metric   ---> ECMP



Normal
Stub ,Total Stub
NSSA ,Total NSSA
==============================================
Stub:
--Area 0 cannot be stub area
-ABR blocks LSA type 4,5  (O E1,O E2 )
-Injects a type 3 Default route (O *IA)
-ABR allows type 3  (O IA)
-ABR will have all specific routes

On All the routers in Stub area

Router ospf <Process-ID>
Area <#> stub
exit

router ospf 1
area 1 stub
exit

R1: Eigrp
conf t
int s3/0
ip add 192.168.12.1 255.255.255.0
no sh
int lo 0
ip add 200.1.1.1 255.255.255.0
int lo 1
```

```
ip add 100.1.1.1 255.255.255.0
exit

router eigrp 1
net 0.0.0.0
exit


R2: ASBR
conf t
int s3/0
ip add 192.168.12.2 255.255.255.0
no sh
int g0/0
Desc conn to R3 in area 0
ip add 10.23.1.2 255.255.255.0
no sh
exit

router ospf 1
net 10.23.1.2 0.0.0.0 area 0
redistribute eigrp 100 subnets route-map RM
exit


access-list 1 permit 200.1.1.0 0.0.0.255
access-list 2 permit 100.1.1.0 0.0.0.255
!
route-map RM permit 10
 match ip address 1
 set metric-type type-1
!
route-map RM permit 20
 match ip address 2
 set metric-type type-2
!
=====================================================
R3: Area 0
conf t
int g0/0
ip add 10.23.1.3 255.255.255.0
no sh
int g1/0
ip add 10.34.1.3 255.255.255.0
no sh
exit

router ospf 1
router-id 3.3.3.3
net 10.0.0.0 0.255.255.255 area 0
exit


R4: ABR
conf t
int g0/0
Desc conn to R3  in area 0
ip add 10.34.1.4 255.255.255.0
no sh
```

```
int g1/0
Desc conn to R5 in area 1
ip add 10.45.1.4 255.255.255.0
no sh
exit

router ospf 1
router-id 4.4.4.4
net 10.34.1.4 0.0.0.0 area 0
net 10.45.1.4 0.0.0.0 area 1
exit

R5: Area 1
conf t
int g0/0
Desc conn to R4  in area 0
ip add 10.45.1.5  255.255.255.0
no sh
int g1/0
Desc conn to R6 in area 1
ip add 10.56.1.5 255.255.255.0
no sh
exit

router ospf 1
router-id 5.5.5.5
net 10.0.0.0 255.0.0.0 area 0
exit

Total Stub:
--Area 0 cannot be stub area
-ABR blocks LSA type 3,4,5  (O E1,O E2 )
-Injects a type 3 Default route (O *IA)
-ABR allows type 1,2
-ABR will have all specific routes

On All the routers in Stub area

Router ospf <Process-ID>
Area <#> stub
exit

On  ABR

Router ospf <Process-ID>
Area <#> stub no-summary
exit
```