DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA
CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)
SUBJECT : NAVIGATION
DATE : 23rd February 2017

Time allowed **THREE hours** Total marks : 180
ANSWER ALL QUESTIONS Pass marks : 70%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required. Electronic devices capable of storing and retrieving are **not** allowed.

1) i) After a grounding incident of a ULCC in Malacca Strains briefly list down 10 key important points related to passage preparation you will consider not been overlooked.

(10 marks)

ii) Give a step by step action procedure you will take as Master of the vessel for having found that the pilot's participation in offering his services tend to jeopardize the vessel.

(20 marks)

2) i) Discuss the terms:
   a) "Master's Standing Orders"
   b) "Master's Night Orders"

(06 marks each)

ii) Give 6 key examples pertaining to each above (i).

(18 marks)

3) i) With the aid of simple sketches, give short introductory notes of the following:

   a) Mercator projection
   b) Conic Projection
   c) Polyconic Projection
   d) Azimuthal or Zenithal Projection
   e) Orthographic Projection

(04 marks each)

ii) From above, simply explain what projections you would consider to use for Marine navigation and the main features you would be looking at in each.

(10 marks)

4) A vessel departs Yap and follows a great circle route to the Dixon Entrance, using the following positions as departure and landfall positions:

Departure Position 9°28'.0 N 138° 09'.0 E
Landfall Position 54°30'.0 N 132° 30'.0 W

Calculate EACH of the following:

a) the total distance on passage
b) the final course at the Dixon Entrance
c) the position of the vertex

(10 marks each)

5) On the evening of the 13th June, whilst in DR position 28°42'.0 S 94°36'.0 W the Master requests the OOW to obtain a set of star sights to check the vessel's GPS receiver. The vessel is steaming on a course of 235°(T) at 14 knots. Weather conditions are clear with some low broken cloud cover to the Northwest of the vessel.

The OOW obtains the following results:

Time	**Star**	**Azimuth**	**True Alt**	**Calc Alt**
1745	Canopus	142°(T)	42° 19'.7	42° 23'.6
1750	Arcturus	270° (T)	54° 12'.3	54° 13'.7
1758	Alphard	062° (T)	28° 15'.6	28° 09'.7
1815	Antares	224° (T)	19° 16'.0	19° 21'.7

a) Plot all FOUR stars for 1800hrs

(20 marks)

b) Determine the vessel's position at 1800hrs

(10 marks)

6) Tropical Revolving Storms are common at certain times of the year in the South Pacific Ocean, especially to the North of New Zealand and off the East Coast of Australia.

a) Sketch a plan view of a TRS in the Western South Pacific Ocean, indicating the likely track prior to and after recurving.

(15 marks)

b) Outline the actions that should be taken by the Master in EACH of the following scenarios, assuming that the storm has recurved:

i) the vessel is to the north of the storms track but within the storm field;

(05 marks)

ii) the vessel is to the south of the storms track but within the storm field;

(05 marks)

iii) the vessel is in the path of the storm.

(05 marks)

Answers

Answer 4(a)

DP 09 28.0 N 138 09.0 E 30 ÷ tan 09 28.0 = 180

LP 54 30.0 N 132 30.0 W 30 ÷ tan 54 30.0 = 21

DLon 270 39.0 W

DLon 089 21.0 E

PA = 90 – 09 28 = 80 32

PB = 90 – 54 30 = 35 30

cos AB = cos P x sin PA x sin PB + cos PA x cos PB

AB = cos-1 (cos P x sin PA x sin PB + cos PA x cos PB)

AB = cos-1 (cos 089 21 x sin 80 32 x sin 35 30 + cos 80 32 x cos 35 30)

AB = 81 55 44.7 x 60 = 4915.74504

Dis = 4915.7 NM

Answer 4(b)

ICo BA

A = tan Lat ÷ tan LHA = tan Lat B ÷ tan DLon = tan 54 30 ÷ tan 089 21 = 0.01590528124 S

B = tan Dec ÷ sin LHA = tan Lat A ÷ sin DLon = tan 09 28 ÷ sin 089 21 = 0.1667553297 N

C = A ± B = 0.01590528124 S - 0.1667553297 N = -0.1508500484 = 0.1508500484 N

tanAz = 1 ÷ C ÷ cosLat

ICo BA = tan-1 (1 ÷ C ÷ cosLat B) = tan-1 (1 ÷ 0.1508500484 ÷ cos 54 30) = N 84 59 37.4 W

Final Co = S 85.0 E

Final Co = 095

Answer 4(c)

sin mid = cosopp x cosopp

sin PV = cos (90 – B) x cos (90 – PB)

PV = sin-1 (cos (90 – B) x cos (90 – PB))

PV = sin-1 (cos (90 – 84 59 37.4) x cos (90 – 35 30))

PV = 35 20 39.27 ~ 90 = 54 39 20.73

Lat V = 54 39.3 N

sin mid = tan adj x tan adj

sin (90 – PB) = tan (90 – B) x tan (90 – P)

P = 90 – tan-1 (sin (90 – PB) ÷ tan (90 – B))

P = 90 – tan-1 (sin (90 – 35 30) ÷ tan (90 – 84 59 37.4))

P = 6 08 29.09

DLon = 006 08.5 W

Lon V = Lon B ± DLon = 132 30.0 W + 006 08.5 W

Lon V = 138 38.5 W

Answer 5(a)

Transfers Intercepts TA - CA

Can (18:00 – 17:45) x 14.0 = 3.5 F -3.9 A

Arc (18:00 – 17:50) x 14.0 = 2.3 F -1.4 A

Alp (18:00 – 17:58) x 14.0 = 0.5 F +5.9 T

Ant (18:00 – 18:15) x 14.0 = 3.5 B -5.7 A

Answer 5(b)

DLat 7.3 N

Dep 0.8 E

AP Lat 28 42.0 S

DLat 00 07.3 N

Lat 28 34.7 S

MLat = 28 42.0 – 00 7.3 ÷ 2 = 28 38 21

DLon = Dep ÷ cosMLat = 0.8 ÷ cos 28 38 21 = 0.9 E

AP Lon 094 36.0 W

DLon 000 00.9 E

Lon 094 35.1 W