EAL
EMTA Awards Limited

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British Horological Institute

Examiner's Report

Certificate in the Repair, Restoration and Conservation of Clocks / Watches

Unit 1 : Final Grade Part I : Theory of Clocks and Watches and their Repair

Nine candidates submitted scripts for assessment. They were required to answer four long questions from eight, plus twenty questions from thirty in the short answer section. All candidates were able to answer the correct number of questions and demonstrated a good knowledge of the syllabus. All the results were comfortably above the required pass standard.

Q1 Recoil escapement, Pivot faults. (8 answers) The action of the escapement was well known and described but drawings were not good - the escape wheel teeth and pallets were poorly drawn. Pivot drawings were better and pivot faults were generally well known.

Q2 Lever Escapement, Balance & Spring. (3 answers) The wheel and pallet action of the escapement was well known and well described. Most candidates knew the typical method of pinning of the outer end of the spring to a stud fitted to the cock, but attachment for the inner end was less well known. Diagrams were again generally poor.

Q3 Stepper Motor, Quartz watch tests. (4 answers) Knowledge of how the stepper motor works was, in most cases, only superficial and not accurately or precisely described. The standard tests for quartz watches were well known but candidates were often vague in explaining what fault may be indicated by which test, if the reading is high or low.

Q4 Mainspring calculation, Hammer springs. (1 answer) Only the mainspring calculation was attempted. The candidate was fully familiar with the theory and formula and scored well.

Q5 Keyless Work, Jumper & Corrector. (7 answers) There was a wide variation in the names of components given by candidates. Most were able to draw the mechanism correctly in the hand-setting position, but some were very badly proportioned despite the similarity to the winding position which was given on the question paper. Descriptions of the star wheel and jumper action were lacking in detail and, in particular, the need for smooth, well polished surfaces to ensure a good action was not understood.

Q6 Watch Lubrication, Water resistant screw-on back. (4 answers) Most could identify a suitable lubricant for the six components listed, and displayed a good working

knowledge of general oiling. Few showed correctly the wedge of oil between tooth and pallet in the lever escapement. With the screw on back, many did not realise that describing the water resistance features was the important aspect, and mentioned this only in passing.

Q7 Rack Striking, Clock lubrication. (2 answers) There was one good description of rack striking; the other candidate presumably misread the question and offered an excellent, well detailed description of countwheel striking! Neither was familiar with the relative merits of animal/vegetable and mineral oils.

Q8 Adjusting pallets in lever escapement, Timing Machine (7 answers) Few could draw accurately the tool for holding the pallet frame while adjusting the stones. The result of adjusting the entry pallet half a degree inwards is complex and none came close to demonstrating knowledge of the effects. More surprisingly, nobody mentioned the sound of the lever striking the banking pin as one of the sounds detected by the timing machine.

Short Answers. This section was answered well, with all candidates scoring between 12 and 18 marks from the possible maximum 20. The imitation compensated balance was not well known; marks were not awarded for "not cut". Further details were required - partially cut through, possibly dummy screws.

Unit 2 : Final Grade Part I : Practical Clock and Watchmaking Techniques

The five candidates were required to make a carriage clock sized assembly including a cock, plate and squared arbor; the exercise is designed to ensure that candidates can demonstrate a broad range of practical making skills. These include filing and turning brass and steel to ensure correct working fits and achieving a high standard of finish whilst maintaining required dimensions within tolerance. Where not specified, the components must be finished in accordance with good practice.

Accuracy
Dimensional accuracy was below average with a higher proportion than usual submitting work with dimensions outside the required tolerance. The length of the squared portion of the arbor and the width of the cock at the widest point were the least accurate. Side and end shake were too great in many cases with few candidates scoring full marks for this aspect of the piece.

Workmanship
Excellent work was seen in many cases; particularly good marks were achieved for the quality of the screw and for the chamfer and curved ends of the cock. The chamfer has always proved a difficult challenge but, this year, chamfers were uniform and flat. There were two areas that presented the greatest difficulty:-

- The small pivot to fit the jewel hole – pivots were not parallel, left unpolished with blemishes and shoulders were not square.
- The lifting slot – a difficult exercise but corners were not square and faces were not flat; filemarks remained.

Finish
One piece was very poorly finished but, otherwise, the standard was higher than usual with two pieces being particularly outstanding. An excellent finish was achieved on both

brass and steel, but in some cases underlying abrasive marks were evident. On some pieces, blue lacquer was used for the screw; this is not acceptable. In one case rust was clearly visible on the screw head.

Unit 4 : Final Grade Part I : The Practical Repair of Clocks

The examination requires candidates to:-

1. Submit a Record of Repairs giving details of eight clock repairs
2. Produce a detailed drawing showing the construction of a recoil anchor escapement. (15 Marks awarded, the candidate has to Pass the escapement drawing)
3. Design and make recoil pallets to work with an escape wheel and plate with two studs which are provided by the Institute; a maximum of eight hours is allocated for this task. (85 Marks awarded, the candidate has to Pass the escapement making)

1. Record of Repairs

The documentation for the Record of Repairs is important and enables the Examiners to carefully check that all the required work has been completed and checked by a qualified professional Member of the Institute. There are signatures required for each **repair** and each of the specified **repair processes**. Although the position for each of the signatures is clear, each year one or two candidates don't ensure that the forms are complete; sometimes the signatures for the repair processes have been forgotten. Unfortunately this year was not an exception:-

Nine Record of Repairs for Final Grade Part I were submitted, two "clock" and seven "watch". All contained the required number and range of completed repairs. Eight fully met the requirements. One candidate had failed to have two of his items signed by a professional member.

The Institute provides forms for the candidate to use, unfortunately a number of candidates felt it is better to produce their own forms. The reasoning would appear to be a preference for typing into a Word document. This practice unfortunately makes the task of the Examiner more difficult because there are slight variations from form to form. Candidates are requested to ensure that only the Institute documentation is used.

2. Drawing Showing Construction of an Anchor Recoil Escapement

Two drawings of the recoil escapement were submitted as a part of the Record of Repairs; both drawings achieved a pass standard with all of the necessary features being present. One was of a very high standard; it is anticipated that these "formal" drawings follow the conventions for Technical Drawing - a border should be present and dimensioning should conform to the drawing conventions.

3. Design and Make Recoil Escapement Pallets

Two candidates submitted pieces. The candidates are required to draw the design of their escapement and example design drawing with instructions is provided; without a satisfactory design it is highly unlikely that the pallets will work correctly. One candidate was unfamiliar with the procedure for drawing the escapement pallets. The drawing is then transferred to the metal by photocopying to the actual scale, pricking through the design or overlaying the metal on the design and drawing directly on the metal blank.

The pallets made by one candidate were correctly designed and accurately made; they functioned efficiently with precise locking and drop. The finishing was generally good but slightly marred by corners becoming rounded during the polishing process. One of the pallet faces was not quite at the correct angle.

Hardening of the pallets is important for long term operation and in this case only the tips were adequately hard, rather than the whole of the acting faces.

Unit 9 : Final Grade Part I : The Practical Repair of Watches

The examination requires candidates to:-

1. Submit a Record of Repairs giving details of ten watch repairs
2. Service a quartz watch and mechanical watch movement; candidates are required to achieve a pass on each watch in order to pass this Unit.

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2. Watch Servicing
Quartz Watch with ETA calibre 955.112 / 956.112

Nine candidates entered the Unit; all watches submitted were working. However, in some watches, there were a few aspects which did meet good commercial standards. Those students will need to demonstrate much higher attention to detail in their servicing work when they proceed to Final Grade Part II Unit 10.

The watches had a simple calendar mechanism and sadly in a few instances the changeover was inaccurately set.

Oiling was generally satisfactory but a methodical approach and more attention to detail is required - one missed pivot will be detrimental to good performance and this was

sometimes the case in the watches submitted. General cleanliness was good but spoilt in some instances by the visible evidence of small items of debris and dandruff! Additional care does need to be taken with all cases, especially quality cases, in order to prevent damage during opening and closing. The use of non-metal dies is to be recommended. All cases satisfactorily passed a water resistance test.

Candidates were required to fit a new stem to the cased movement. This requires care to ensure that the stem is exactly the correct length when the button is firmly screwed in place. Cutting the stem initially a little long, and then proceeding to shorten the stem by trial and error, will ensure a good outcome. The gap between the button and the case can be tested with a piece of tissue paper; there should just be visible daylight in the gap. Contact between button and case should not occur. The use of a suitable adhesive to retain the button has become normal practice to ensure the button cannot possibly work loose.

It is good practice when servicing a quartz watch to change all consumable items which are subject to deterioration.

The service manual is provided to guide candidates when selecting correct replacement parts and lubrication.

Dial retention in some movements is by using rotating latches which slide away from the dial foot. It provides a rigid attachment and any attempt to force off the dial will cause irreversible damage – one or two did.

Exact alignment of hands is a fundamental aspect of good servicing and more care needs to be taken; a tolerance of a ¼ minute error in the minute hand, at the hour, is the maximum acceptable at this level.

P7001 mechanical movement

The cleanliness and condition of the finished work was generally satisfactory with only minor marks on screws and components. Lubrication was generally of a good standard, particularly shockproof setting; there were some instances where the pallets showed oil on non acting faces and inadequate oiling on the impulse face. Candidates must be reminded that where smears are left on pallet jewels or jewel holes this will allow the oil to be gradually drawn away from the point where it is required. Detailed guidance on this topic can be found in the recent BHI publication entitled ‘The Lubrication of Watches and Clocks’.

Lubrication of keyless work is an important area to ensure smooth operation and reduce wear. Grease should be applied to the acting surfaces of each and every part – including the stem, setting lever, keyless cover, return bar, return bar spring and keyless cover. Some candidates relied on one or two blobs to distribute themselves to the required surfaces.

Fault finding by candidates is showing signs of improvement but a systematic check on the operation and condition of each component prior to and during dismantling is essential if damaged parts are to be located. Examiners introduce faults to check whether the candidate had applied these skills correctly. Faults will include items which are damaged, worn or badly adjusted preventing correct operation; dirt is not considered as fault because

the servicing will remove the dirt. Candidates are not credited with marks for identifying dirty components.

Faulty shock springs, broken or distorted are included as faults thus ensuring that candidates are able to partially withdraw the setting and replace the shock spring. This "Repair Process" is part of the student's Record of Repairs and candidates are advised to master this skill before entering this unit.

When completed, the Examiners expect the balance spring to be flat and centred with no chance of it contacting other components during normal operation. This is not always straightforward but it is an essential skill which students need to master – some of the work showed that more practice is required.

The cohort of candidates generally scored well but two candidates failed to achieve the necessary standard on both of the watches, essential for a pass to be awarded.

The Examiners exercise considerable care to ensure that there can be no error in the final mark awarded. If, however, you believe that a mistake has occurred then you may request that your paper be assessed again. The charge for remarking is £40.00 per unit, which must accompany the request. This should be received on or before 31st August 2009. The fee will be returned if it is found that as a result of the appeal process the outcome of the examination (i.e. Pass / Fail or Pass / Pass with Merit) is changed.