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FAN MANUFACTURING TECHNICIAN



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LEARNER GUIDE

National Vocational Certificate Level 3

Version 1 - October, 2019



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Introduction

Welcome to your Learner's Guide for the *Assembler* Programme. It will help you to complete the programme and to go on to complete further study or go straight into employment.

The *Assembler* programme is to engage young people with a programme of development that will provide them with the knowledge, skills and understanding to start this career in Pakistan. The programme has been developed to address specific issues, such as the national, regional and local cultures, the manpower availability within the country, and meeting and exceeding the needs and expectations of their customers.

The main elements of your learner's guide are:

- **Introduction:**
 - This includes a brief description of your guide and guidelines for you to use it effectively
- **Modules:**
 - The modules form the sections in your learner's guide
- **Learning Units:**
 - Learning Units are the main sections within each module
- **Learning outcomes:**
 - Learning outcomes of each learning units are taken from the curriculum document
- **Learning Elements:**
 - This is the main content of your learner's guide with detail of the knowledge and skills (practical activities, projects, assignments, practices etc.) you will require to achieve learning outcomes stated in the curriculum
 - This section will include examples, photographs and illustrations relating to each learning outcome
- **Summary of modules:**
 - This contains the summary of the modules that make up your learner's guide
- **Frequently asked questions:**
 - These have been added to provide further explanation and clarity on some of the difficult concepts and areas. This further helps you in preparing for your assessment.
- **Multiple choice questions for self-test:**
 - These are provided as an exercise at the end of your learner's guide to help you in preparing for your assessment.

Modules

Module 6: 072200907 Perform parts assembling

Objective of the module: The aim of this module is to develop knowledge, skills and understanding required to perform assembling of different fan parts

Duration: 160 hours **Theory:** 32 hours **Practical:** 128 hours

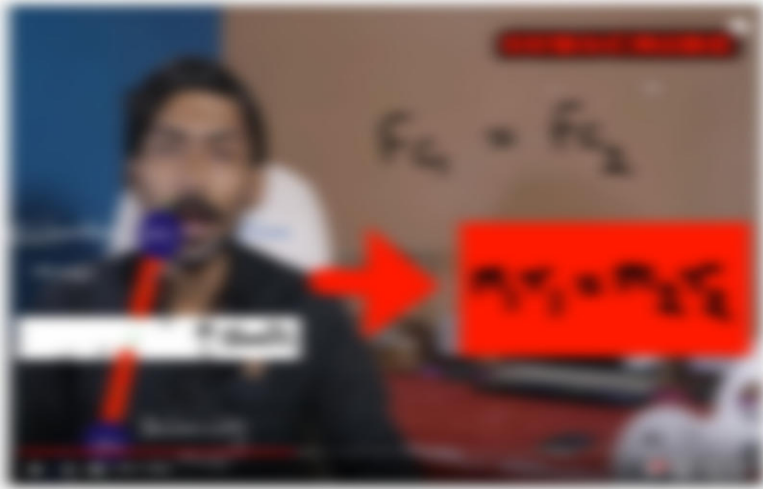
Learning units	Learning Outcomes	Learning Elements	Materials Required
LU1: Perform balancing of ceiling fan body & plates	The trainee will be able to: <ul style="list-style-type: none"> Mount ceiling fan body and plates on mandrel Remove or add weights from body and plates for balancing if required 	<ul style="list-style-type: none"> Knowledge about balancing Understanding of balancing requirements of ceiling fan body and plates Understanding of balancing machine operation 	<ul style="list-style-type: none"> Balancing machine Drill machine Punching plier Weights for balancing machine Drill bits Ceiling fan body and plates Air compressor Adhesives
LU2: Press bearings in fan body and plates	The trainee will be able to: <ul style="list-style-type: none"> Set press machine as per requirement Select bearing as per requirement Press bearing in housing 	<ul style="list-style-type: none"> Knowledge about bearing types and their uses Understanding of bearing construction and numbering method. Understanding of bearing adjuster press machine operation. Understanding of bearing fitting and sizing requirements 	<ul style="list-style-type: none"> Bearing press machine Bearings Fan body and plates
LU3: Perform rotor balancing	The trainee will be able to: <ul style="list-style-type: none"> Load rotor on balancing machine as per requirement Remove weights(if required) from rotor for balancing 	<ul style="list-style-type: none"> Knowledge about balancing Understanding of balancing requirements of fan rotor Understanding of balancing machine operation. 	<ul style="list-style-type: none"> Balancing machine Drill machine Punching plier Weights for balancing machine

Learning units	Learning Outcomes	Learning Elements	Materials Required
			<ul style="list-style-type: none"> • Drill bits
LU4: Press armature (for DC fans) stator (for AC fans) in fan body housing	The trainee will be able to: <ul style="list-style-type: none"> • Load fixture on press machine • Load fan body in the jig • Place stator/armature in the body and press accordingly • Check air gap with filler gauge 	<ul style="list-style-type: none"> • Knowledge about fixtures. • Understanding the usage of press machine. • Understanding of loading fixture and fan body on press machine. • Knowledge of fitting requirements of stator in the fan body. • Understanding of usage of filler gauge for fitting 	<ul style="list-style-type: none"> • Hydraulic press machine • Fixture for holding fan body on hydraulic press machine • Filler gauge • Stator/armature • Fan body housing
LU5: Assemble fan body and plate	The trainee will be able to: <ul style="list-style-type: none"> • Place plate on the fan body • Align screw holes of fan body and plate accordingly. • Press the plate on the fan body and fasten the screws 	<ul style="list-style-type: none"> • Knowledge about assembly process drawing. • Understanding of assembly process sequence. • Understanding of fan alignment requirements. 	<ul style="list-style-type: none"> • Fan body and plate • Screw driver • Filler gauge
LU6: Perform fan motor testing	The trainee will be able to: <ul style="list-style-type: none"> • Mount the fan motor onto the hanger. • Connect to the power supply • Inspect Eccentricity, Noise and Short Circuit/ Continuity. • Inspect motor Direction • Inspect volt, ampere, watts and Power Factor. 	<ul style="list-style-type: none"> • Knowledge about fan motor construction. • Knowledge about supply wire attachments in their respective slots. • Knowledge and understanding of functional testing. • Understanding of ensuring quality testing parameters (eccentricity, noise, short circuit/ continuity, vibration, direction of rotation, volt, ampere, watts, etc.) • Knowledge of using different motor testing equipment. 	<ul style="list-style-type: none"> • Fan motor • Watt meter • Volt meter • Ampere meter • Frequency meter • Tachometer • Sound level meter
LU7:	The trainee will be able to:	<ul style="list-style-type: none"> • Understanding of installation of blades with 	<ul style="list-style-type: none"> • Fan_blades

Learning units	Learning Outcomes	Learning Elements	Materials Required
Install Fan blade	<ul style="list-style-type: none"> • Place jane between plate and blades • Mount the blades with screws and spring washers. 	fan motor	<ul style="list-style-type: none"> • Pneumatic screw driver along with compressor • Fan motor • Screws • Jane • Spring washers
LU8: Test Fan with Blades	The trainee will be able to: <ul style="list-style-type: none"> • Mount the fan for testing • Make connections and supply power to the fan • Check speed with tachometer • Check ampere, volt, and watt • Check balancing and air flow of blades 	<ul style="list-style-type: none"> • Understanding of fan mounting methods • Knowledge and understanding of final lot testing • Understanding of blade weighing balance and angle. • Understanding of ensuring quality testing parameters (Eccentricity, Noise, Short Circuit/ Continuity, vibration, Direction of rotation, volt, ampere, watts, power factor, speed, air delivery, etc.) 	<ul style="list-style-type: none"> • Assembled Fan • Watt meter • Volt meter • Ampere meter • Frequency meter • Tachometer • Sound level meter

Examples and illustrations

VIDEOS:



Balancing

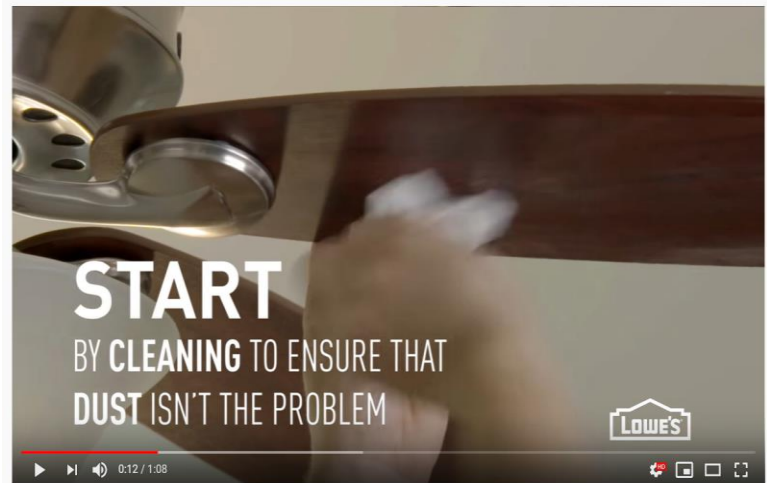
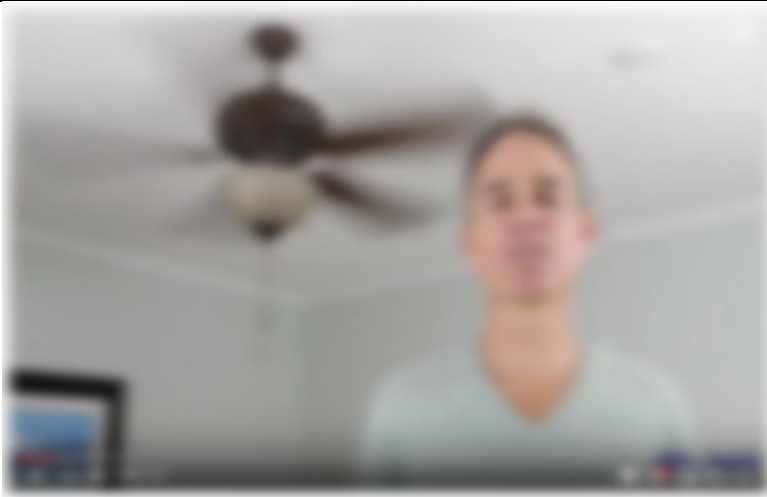
<https://www.youtube.com/watch?v=nhzAIZTGjj0>

<https://www.youtube.com/watch?v=atn63hrbyEg>

<https://www.youtube.com/watch?v=2XayZbaLXmU>

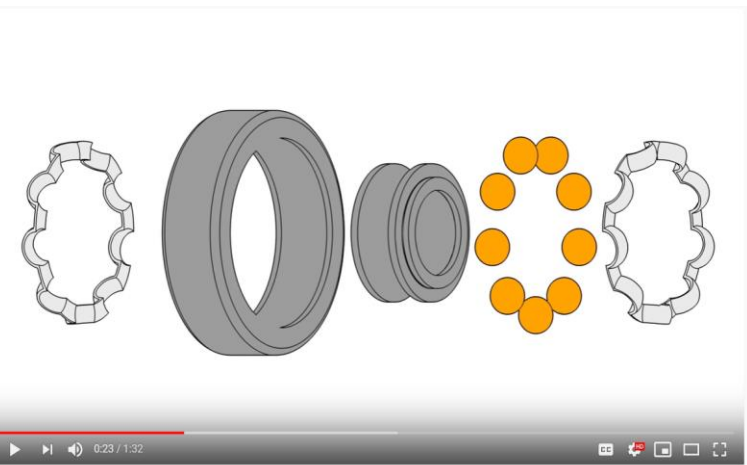
<https://www.youtube.com/watch?v=WDbghDRgA6c>

<https://www.youtube.com/watch?v=a7a4uVYa9VA>





Fan balancing



What is bearing?

Bearings

<https://www.youtube.com/watch?v=Jt0ou8Q5Fo8>

<https://www.youtube.com/watch?v=Mybf-XCA4H4>

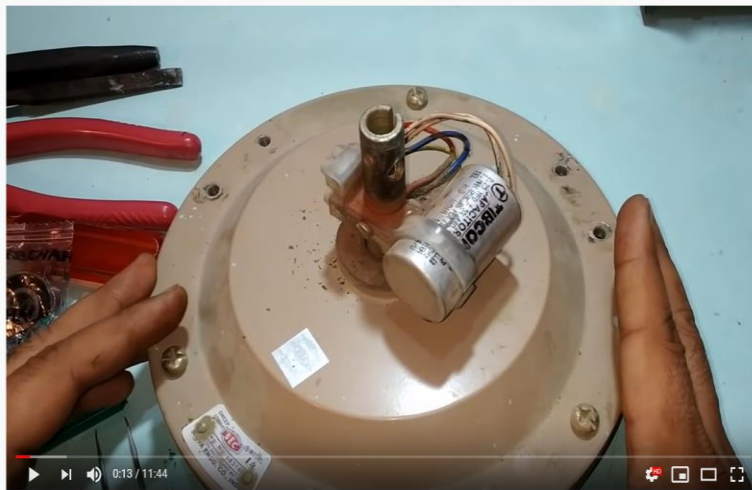
<https://www.youtube.com/watch?v=dgA6tO6tAA0>

<https://www.youtube.com/watch?v=-cSKj7caYgs>

<https://www.youtube.com/watch?v=Q3lQ9ikJriQ>



Introduction to Bearings - Types of bearings





How to change Top end cover Ball Bearing of Ceiling Fan



Rotor Balancing

<https://www.youtube.com/watch?v=fFOA5UKOMmA>

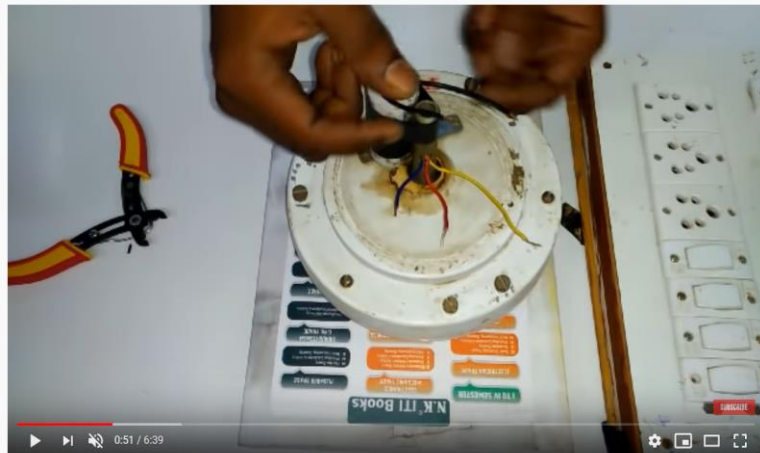
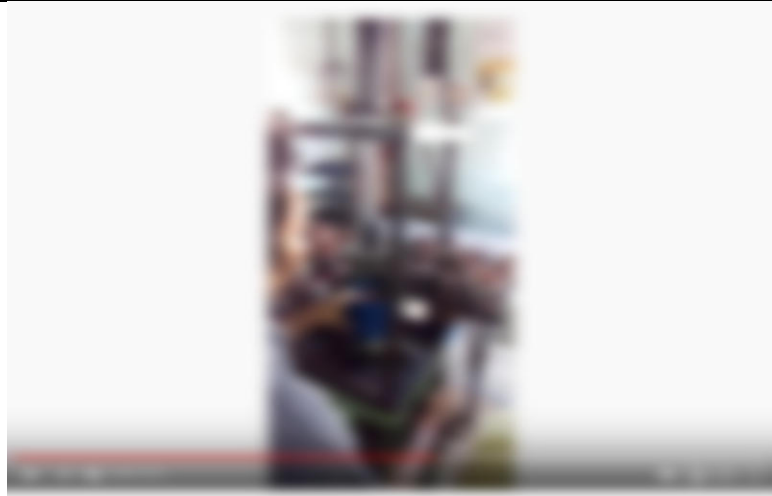


Shaft press for ceiling fan

Pressing armature in fan body housing

<https://www.youtube.com/watch?v=Lfakw9Sc4NI>

<https://www.youtube.com/watch?v=kh1OOye-xb8>



ceiling fan testing

Fan motor testing

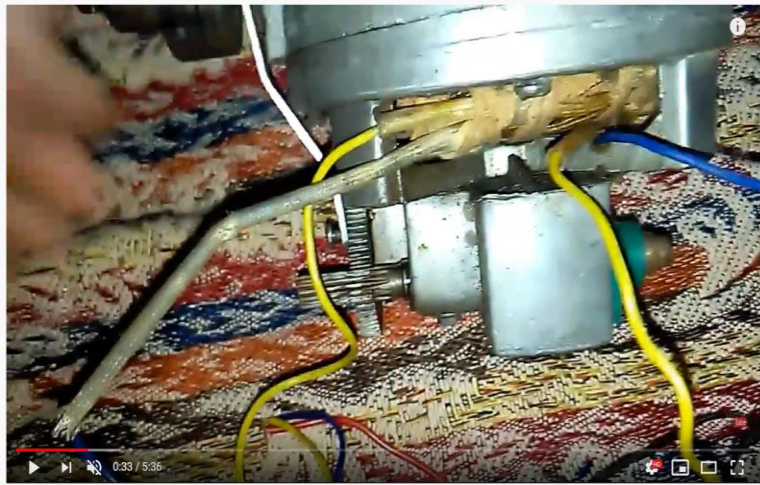
<https://www.youtube.com/watch?v=sSEmcEXqN6U>

<https://www.youtube.com/watch?v=jrYE3JnABNQ>

<https://www.youtube.com/watch?v=CoOvcVK8FWw>



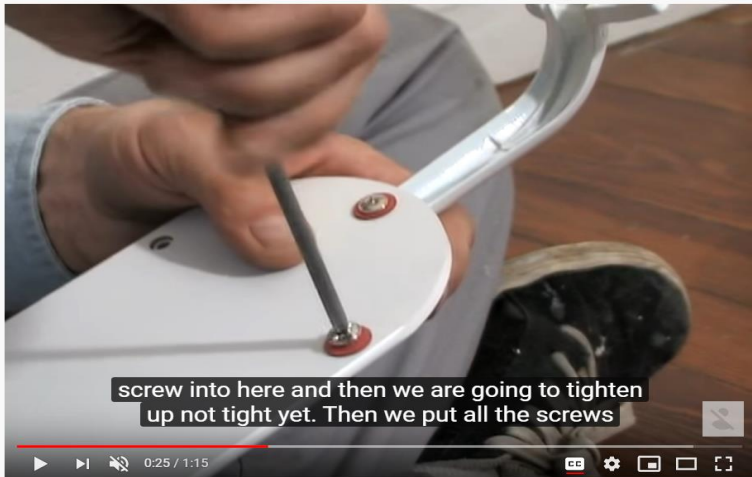
How to check Ceiling Fan Winding with Series Testing Board



how to install ceiling fan "blades"



How to install ceiling fan "blades"



Installing blades on fan

https://www.youtube.com/watch?v=k_inDR84Qgc

<https://www.youtube.com/watch?v=wUKjvneuAM>

Fan Bearing related article

<https://www.sciencedirect.com/topics/engineering/fan-bearing>

Module summary

Module Title and Aim	Learning Units	Timeframe of modules
<p>Module 6: Perform parts assembling</p> <p>Aim: The aim of this module is to develop knowledge, skills and understanding required to perform assembling of different fan parts</p>	<p>LU1: Perform balancing of ceiling fan body & plates</p> <p>LU2: Press bearings in body and plates</p> <p>LU3: Perform rotor balancing</p> <p>LU4: Press armature (for DC fans) / stator (for AC fans) in fan body housing</p> <p>LU5: Assemble fan body and plate</p> <p>LU6: Perform fan motor testing</p> <p>LU7: Install fan blades</p> <p>LU8: Test fan with blades</p>	<p>160 Hours</p>

Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?	Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?	You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?	The entry requirement for this course is National Vocational Certificate Level-2 in Fan Manufacturing Technician(Fabricator) or National Vocational Certificate Level-2 in Fan Manufacturing Technician(Painter) or National Vocational Certificate Level-2 in Fan Manufacturing Technician(Foundry Man)
4. How can I progress in my educational career after attaining this certificate?	You shall be eligible to take admission in the National Vocational Certificate Level-4 in Fan Manufacturing Technician (Supervisor). You shall be able to progress further to a level-5, DAE or equivalent course in relevant trade. In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?	You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?	There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program.
8. What is the duration of this course?	The duration of the course work is 310 Hours
9. What are the class timings?	The classes are normally offered 25 days a month from 08:00am to 01:30pm. These may

	vary according to the practices of certain institutes.
10. What is equivalence of this certificate with other qualifications?	As per the national vocational qualifications framework, the level-4 certificate is equivalent to Matriculation. The criteria for equivalence and equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC).
11. What is the importance of this certificate in National and International job market?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTTC website.
12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?	You shall be able to take up jobs in the fan manufacturing industries in assembly shop
13. What are possible career progressions in industry after attaining this certificate?	You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.
14. Is this certificate recognized by any competent authority in Pakistan?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). The official certificates shall be awarded by the relevant certificate awarding body.
15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?	On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.
16. How much salary can I get on job after attaining this certificate?	The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount.
17. Are there any alternative certificates which I can take up?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
18. What is the teaching language of this course?	The teaching language of this course is Urdu and English.
19. Is it possible to switch to other certificate programs during the course?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
20. What is the examination / assessment system in this program?	Competency based assessments are organized by training institutes during the course

	<p>which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.</p>
<p>21. Does this certificate enable me to work as freelancer?</p>	<p>You can start your small business of stitching leather garments, gloves or other products; or offer services in pattern making and fashion designing. You may need additional skills on entrepreneurship to support your initiative.</p>

Test Yourself (Short & Multiple Choice Questions)

1	Why does fan wobble?	
2	What is fan balancing?	
3	Air delivery of fan depends upon which part?	
4	Which tool is used to measure the air gap between rotor and stator?	
5	Why ceiling fan have three blades?	
6	In fan assembly shop, hydraulic press is used for a) Winding fan motor b) Varnishing fan motor c) Inserting armature in fan body housing d) To test fan motor	
7	Why bearings are used in fan?	
8	Bearing number shows a) Size of bearing b) Quality of bearing c) Price of bearing d) Usage of bearing	
9	Which part of pedestal fan is balanced a) Stator b) Fan blades c) Fan housing d) Fan base plate	
10	Magnets are used in a) AC Fans b) DC Fans c) Pedestal Fan	

	d) Table Fan	
11	How DC fan works?	
12	Capacitor is used to start fan motor a) True b) False	

