

Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH/ME(O)/SEM-5/ME-501/2012-13

2012

I.C. ENGINE & STEAM TURBINE

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) In a four stroke engine, the working cycle is completed in
 - a) one revolution of the crank shaft
 - b) two revolution of the crank shaft
 - c) three revolution of the crank shaft
 - d) four revolution of the crank shaft.
 - ii) The thermodynamic cycle on which gasoline engine works, as
 - a) Otto cycle
 - b) Joule cycle
 - c) Rankine cycle
 - d) Stirling cycle.
 - iii) The theoretically correct mixture of air and petrol is
 - a) 10 : 1
 - b) 15 : 1
 - c) 20 : 1
 - d) 25 : 1.

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- iv) A petrol engine has compression ratio from
 - a) 6 to 10 b) 10 to 15
 - c) 15 to 25 d) 25 to 40.
- v) The air and fuel ratio of the petrol engine is controlled by
 - a) carburetor b) injector
 - c) governor d) none of these.
- vi) The steam turbine used in modern high capacity thermal power plant is
 - a) impulse turbine
 - b) reaction turbine
 - c) velocity-compounded steam turbine
 - d) impulse-reaction turbin
- vii) Compounding of impulse steam turbine is to
 - a) reduce the speed b) increase the speed
 - c) vary the speed d) none of these.
- viii) The exhaust steam from a turbine discharged to
 - a) condenser b) boiler
 - c) ash handling plant d) none of these.
- ix) Pure reaction turbine is
 - a) feasible b) not feasible
 - c) partially feasible d) none of these.
- x) The speed of the steam turbine is controlled by
 - a) governor b) fly wheel
 - c) centrifugal pump d) none of these.

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GROUP – B

(Short Answer Type Questions)

Answer *all* questions.

$3 \times 5 = 15$

2. With respect to air standard cycles $\eta_{otto} > \eta_{dual} > \eta_{diesel}$
explain using cycle diagram.
3. What is meant by supercharging in I.C. engines ? State the factors which increase the output of supercharging.
4. Explain with necessary sketches the different types of compounding used in Impulse Steam Turbine.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

$3 \times 15 = 45$

5. In a simple impulse turbine, the nozzle angle is 16° and the blade outlet angle is 25° . Inlet velocity of steam as it issues from nozzle is 720 m/sec and the blade velocity is 180 m/sec. The blade velocity coefficient may be taken as 0.75. The steam flow rate is 1 kg/sec. Find :
 - i) Energy dissipated in blades due to friction
 - ii) Power developed
 - iii) Diagram efficiency.

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6. The following details were noted in a test on a four cylinder four stroke engine, diameter = 100, stroke = 120 mm, speed of the engine = 1600 rpm, fuel consumption = 0.2 kg/min, calorific value of fuel is 44000 kJ/kg, difference in tension on either side of the brake pulley = 40 kg, brake circumference = 300 cm. If the mechanical efficiency is 80%, calculate :
- break thermal efficiency
 - indicated thermal efficiency
 - indicated mean effective pressure
 - break specific fuel consumption.
7. a) Compute the brake mean effective pressure of a four cylinder, four stroke diesel engine having 150 mm bore and 200 mm stroke which develops a brake power of 73.6 kW at 1200 rpm.
- b) Find the mean piston speed of a diesel engine running at 1500 rpm. The engine has a 100 mm bore and L/d ratio is 1.5. 10 + 5
8. A 50% reaction turbine running at 500 rpm, consumes 13.6 kg/s of steam. If the adiabatic heat drop in turbine 460 kJ/kg and the turbine internal efficiency is estimated to be 0.9, what is the internal power developed by the turbine ? At a certain stage off this turbine the mean steam conditions are 1.1 bar and 0.85 dry. The discharge blade tip angle is 20° and the blade to steam velocity is 0.7. If the blade is $\frac{1}{12}$ of the mean ring.

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