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| **Scheme of Valuation/Answer Key**(Scheme of evaluation (marks in brackets) and answers of problems/key) |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**FOURTH SEMESTER B. TECH DEGREE EXAMINATION, APRIL 2019 |
| **Course Code: ME206** |
| **Course Name: FLUID MACHINERY (ME)** |
| Max. Marks: 100 |  | Duration: 3 Hours |
| **PART A** |
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|  |  | ***Answer any three questions, each carries 10 marks*** | Marks |
| 1 | a) | FigureDerivation  (Full credits can be given to the derivation of expression only. No need to prove the maximum efficiency value) | 13 |
|  | b) | (i) FigDerivation(ii) A = 0.004417 m² F = ρAV² = 1766.8N | 1212 |
| 2 | a) | (i) Velocity of jet = 33.62m/s(ii) u = $\frac{∏DN}{60}$, Diameter of wheel, D = 1.44m(iii) discharge Q = 0.1912 m³/s(iv) Diameter of the jet (d) = 85mm(v) size of bucketsWidth, 5d = 425mmDepth of buckets, 1.2d = 102mm(iv) Number of buckets on the wheel, Z = 15+$ \frac{D}{2d}$ = 23.5say = 24 | (1)(1)(1)(1)(1)(1) |
|  | b) | 1. Gross head
2. Net head
3. Hydraulic efficiency
4. Mechanical efficiency
 | (1)(1)(1)(1) |
| 3 | a) | (i) governing(ii) fig(iii) explanation | (1)(1)(3) |
|  | b) | FunctionFigureDraft tube theory | (1)(1)(3) |
| 4 | a) | 1. Power generated

$Ƞ\_{0}$ = $\frac{power developed}{water power}$ =$\frac{P}{\frac{ρgQH}{1000}}$$P= Ƞ\_{0}$× $\frac{ρgQH}{1000}=1986.5KW$1. Specific speed of the Turbine, $N\_{s} $= $\frac{N\sqrt{P} }{ H^{5/4} }$ =**159.46 r.p.m**

As specific speed lies between **51** and **255**, the turbine is a **Francis Turbine** | (2)(2)(1)(1) |
|  | b) | Type number explanationDefinition of specific speed Derivation to get result $N\_{s}$ = = $\frac{N\sqrt{p} }{ H^{5/4}}$ | (1)(1)(2) |
| **PART B** |
| ***Answer any three questions, each carries 10 marks*** |
| 5 | a) | Minimum starting speed N = 891.8 rpm ( When value of head is taken as 30 m)Minimum Starting speed = 89.18 rpm (when the head is taken as 30 cm as given in the question). For both the cases full credits can be given. | (4) |
|  | b) | Main characteristic curves with figureOperating characteristics with figConstant efficiency curves with figure | (2)(2)(2) |
| 6 | a) | 1. Suction head
2. Delivery head
3. Static head
4. Manometric head.
 | (1)(1)(1)(1) |
|  | b) | (i) figureexplanation (ii)Priming & necessity of priming | (1)(2)(3) |
| 7 | a) | (i) ideal indicator diagram with fig(ii) derivation of W.D proportional to indicator diagram  | (2)(4) |
|  | b) | Area, A = 0.31416m²The theoretical discharge of the pump, $Q\_{th}$ = 0.01047m³/s1. Co – efficient of discharge, $C\_{d}$ = $\frac{Qact}{Qth}$ = 0.955
2. Slip = 0.00047m³/s

 Percentage slip of the pump. =4.489 % |  (1)(1)(1)(1) |
| 8 | a) | Clear derivation with final result, 39.2% | (4) |
|  | b) | `(i) figureExplanation1. figure
2. explanation
 | (1)(2)(1)(2) |
| **PART C** |
| ***Answer any four questions, each carries 10 marks*** |
| 9 | a) | $P\_{1}V\_{1}$ = MR$T\_{1}$A = 0.0314m²$V\_{1}$=A x L = 0.00942m³M = 0.01094 Kg/cycle$W\_{polytropic }$= $\frac{n}{n-1}$ $P\_{1}V\_{1} [(\frac{P\_{2}}{P\_{1}})^{\frac{n-1}{n}} $-1] Jules / cycle =2513.96 J/CycleMass of air compressed / minute = $W\_{polytropic }$x $\frac{N}{60}$ =10474.83W =**10.47483 KW****Power required =** $\frac{10.474}{0.80}$ = **13kw** | (1)(1)(1)(1)(1) |
|  | b) | The final expression given in the question is W= $RT\_{1}\frac{n}{n-1}$ $[(r\_{p}) ^{\frac{n}{n-1}}$ -1] and it is wrong. The correct equation is W= $RT\_{1}\frac{n}{n-1}$ ((rp) (n-1)/n - 1). Full credits can be given for the complete correct steps even though final expression is wrong. | (5) |
| 10 | a) | $P\_{1}V\_{1}$ = MR$T\_{1}$ =168182 Kg/cycle$W\_{polytropic }$= $\frac{n}{n-1}$ $P\_{1}V\_{1} [(\frac{P\_{2}}{P\_{1}})^{\frac{n-1}{n}} $-1] Jules / cycle =413101.23 J/Cycle$W\_{polytropic }$x $\frac{N}{60}$ = 6885 W, =6.885KW | (1)(2)(2) |
|  | b) | Clear derivation with final result $p\_{2}$ = $\sqrt{p\_{1 }x p\_{3} }$ | (5) |
| 11 | a) | Classification minimum four | (4) |
|  | b) | Figureexplanation | (2)(4) |
| 12 | a) | Figureexplanation | (2)(3) |
|  | b) | Five methods (5\*1) | (5) |
| 13 | a) | The temperature rise = 213.68ºC$$The static pressure ratio, \frac{P\_{2}}{P\_{1}}=4.748$$ | (3)(3) |
|  | b) | Clear derivation with final result, Inlet , $B\_{1= \frac{mv\_{1}}{πD\_{1}V\_{f\_{1}}}} , $Out let $B\_{2= \frac{mv\_{2}}{πD\_{2}V\_{f\_{2}}}}$ | (4) |
| 14 | a) | Figureexplanation | (2)(2) |
|  | b) | Merits (at least 3)Demerits (at least3) | (3)(3) |
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