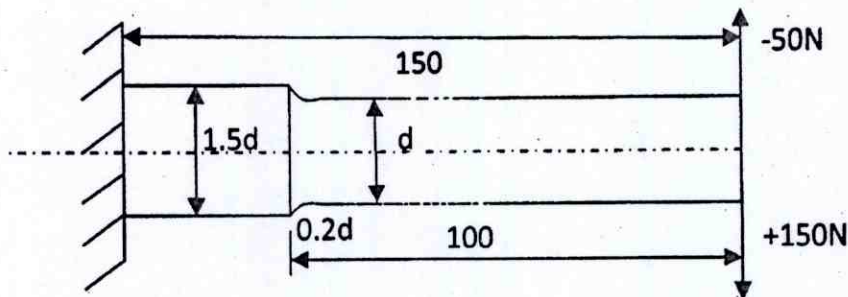


- 1 (a) Write Gerber, Goodman and Soderberg's equation with S-N diagram. 10
- (b) A cantilever beam made of cold drawn carbon steel 40C8 ($\sigma_u = 600$ N/mm² and $\sigma_y = 380$ N/mm²) is shown in fig. The force P acting at the free end varies from -50N to +150 N. The expected reliability is 90%. And the factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam at the fillet cross-section.



6

UNIT - II

- 2 (a) Discuss the design of piston for an internal combustion engine. 10
- (b) The cylinder of a four stroke diesel engine has following specifications
 Brake power = 7.5 kW
 Speed = 1400 rpm
 Indicated mean effective pressure = 0.35 MPa
 Mechanical efficiency = 80%
 Maximum gas pressure = 3.5 MPa
 The cylinder liner and head are made of gray cast iron FG 260 ($\sigma_{ut} = 260$ N/mm² and $\mu = 0.25$). The studs are made of plain carbon steel 40C8 ($\sigma_{yt} = 380$ N/mm²). The factor of safety for all parts is 6.
 Calculate :
 (i) Bore and length of cylinder liner
 (ii) Thickness of the cylinder liner
 (iii) Thickness of cylinder head
 (iv) Size, number of studs

6

OR

- 2 (a) Discuss about Design procedure and crankshaft. 6
- (b) Design a connecting rod for a diesel engine with the following data :
 Cylinder bore = 125 mm
 Length of connecting rod = 300 mm
 Maximum gas pressure = 3.5 Mpa
 Mass of reciprocating parts = 1.6 kg
 Engine speed = 2200 rpm
 Length of stroke = 125 mm
 Assume suitable data and state the assumptions you make. 10

UNIT - III

- 3 (a) It is required to design a helical torsion spring for a window shade. The spring made of oil-hardened steel wire of Grade-4. The yield strength of material taken as 50% of ultimate tensile stress with factor of safety is 2 and mean diameter is kept as 18 mm. The maximum bending moment acting on the spring is 250 N-mm and modulus of elasticity is 207000 N/mm². The stiffness of the spring should be 3 N-mm. 8
- (b) A helical compression spring subjected to a force which varies from 2.5 kN to 3.5 kN, the spring index and deflection takes as 5 and 5 mm. The spring made of cold-draw steel with ultimate stress and modulus of rigidity are 1050 N/mm² and 81370 N/mm². Design the spring if the permissible stress taken as 50% of ultimate stress. 8

OR

- 3 (a) Describe the design procedure for belt drive system. 8
- (b) A pulley made of grey cast iron fg 150, transmits 10 kw of power at 720 rpm. The diameter of the pulley is 500 mm. The pulley has four arms of elliptical cross-section, in which the major axis is twice of the minor axis. Determine the arm, if the factor of safety is 5. 8

UNIT - IV

- 4 (a) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. 8

- (b) A pair of straight bevel gears, mounted on shafts which are intersecting at right angles, consisting of a 21 teeth pinion meshing with a 28 teeth gear. The pressure angle is 20° . The pinion shaft connected to an electric motor developing 5 kW rated power at 1440 rpm. The service factor taken is 1.5. Both gears are made of case hardened steel ($S_{ut} = 750 \text{ N/mm}^2$) and heat treated to a surface hardness of 380 BHN. The limits of errors are $10 \mu\text{m}$. The module and face width are 4 mm and 20 mm. Determine the factor of safety against bending as well as against pitting failure. 8

OR

- 4 (a) Write the expressions for static strength, limiting wear load and dynamic load for helical gears and explain the various terms used therein. 8

- (b) Discuss about wear strength of gear for spur gear. 8

UNIT - V

- 5 (a) What do you mean by bearing ? Why ball and roller bearing are called 'antifriction' bearing ? 8

- (b) Explain the design procedure of ball bearing with following :
Design a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load. 8

OR

- 5 (a) Who do you mean by 'Lubrication' ? Explain all methods of lubrication in bearing. 8

- (b) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load. Find out the bearing number. 8

UNIT - II

- 2 (a) Explain the principle and working of Ultrasonic Machining Process. 8
- (b) Estimate the material removal rate of a brittle material with the flow strength of 4GPa in AJM process. The abrasive flow rate is 2gm/min. velocity is 200 m/s and density of abrasive is 3 gm/cc. 8

OR

- 2 (a) Describe the following variables of abrasive jet machining system :
 (i) Types of Carrier gas
 (ii) Size of Abrasive grain
 (iii) Velocity of Abrasive jet
 (iv) Shape of cut 8
- (b) A Glass is being machined at a MRR of $6\text{mm}^3/\text{min}$ by Al_2O_3 and abrasive grit has diameter of $150\ \mu\text{m}$. If $100\ \mu\text{m}$ grits were used then what would be the material removal rate ? 8

UNIT - III

- 3 (a) Explain the working principle of electro discharge machining with schematic diagram. Write the name of the processes which come in the category of the thermo electric advanced machining process ? 8
- (b) Explain the principle of laser beam machining with its applications. 8

OR

- 3 (a) Explain the working principle of plasma arc machining with schematic diagram. 8
- (b) Discuss various tool materials and types of dielectric fluids used in the electric discharge machining. 8

278

UNIT - IV

- 4 (a) Write short notes on :
- (i) Tool Feeding System in ECM Process.
 - (ii) Electrolyte Supply and Cleaning System in ECM Process.
 - (iii) Power Source in ECM Process
 - (iv) Work piece and holding system in ECM Process
- 8
- (b) List the common electrolytes used in ECM with their functions.
- 8

OR

- 4 (a) Explain the working principle of chemical machining with schematic diagram ? What are the advantages and disadvantages of chemical machining process ?
- 8
- (b) Explain the Electrochemical grinding process with schematic diagram.
- 8

UNIT - V

- 5 (a) What are the general consideration of Nano scale cutting and describe it with MD simulation model ?
- 8
- (b) Describe the working of Micro turning process.
- 8

OR

- 5 (a) Describe the different evaluation techniques for Micro machining process.
- 8
- (b) Write the application of Micro-machining and Nano-machining in industry.
- 8

6E7013

Roll No. : _____

Total Printed Pages : **3****6E7013**

B. Tech. (Sem. VI) (Main / Back) Examination, April-May 2018
Mech. Engg.
6ME3A Mechatronics

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL . 2. NIL

UNIT - I

- 1 (a) Write the scope and application of mechatronic system. 8
- (b) What do you mean by flexible manufacturing system (FMS) ? Write merits and demerits of FMS. 8

OR

- 1 (a) What do you mean by Mechatronics ? 8
- (b) Explain the basics of micro and nanotechnology including their applications. 8

UNIT - II

- 2 (a) Explain the working of Linear variable differential transducer (LVDT) with suitable diagram. 8
- (b) Explain the working principle of pneumatic and hydraulic actuator with diagram. 8

OR

- 2 (a) Write a brief introduction of actuator. Write its applications. 6
- (b) Define the following term : 10
- (i) Hall effect sensor
- (ii) Proximity sensor

UNIT - III

- 3 (a) What is the role of control in Mechatronics ? Explain in detail. 8
- (b) Explain the principle of operation of the variable reluctance stepper motor. 8

OR

- 3 (a) How can you define design optimization of mechatronics system ? 8
- (b) Explain continuous and discrete time signals. 8

UNIT - IV

- 4 (a) Define "Data Acquisition" system in mechatronics. 6
- (b) Define the following terms :
- (i) Quantizing theory
- (ii) Digital to Analogue Converter (DAC) 10

OR

- 4 (a) Explain the role of Data Loggers (DL) and computer with plug in board in data acquisition system. 8
- (b) Explain Analogue to digital converter (ADC). 8

UNIT - V

- 5 How can you define elevators and escalator, their working, also show the role of mechatronics. 16

OR

- 5 Explain any two mechatronic systems with suitable diagrams.
- (a) Engine Management system
- (b) Automatic Camera
- (c) Automatic Washing Machine. 16

6E7014

Roll No. : _____

Total Printed Pages : 4

6E7014

B.Tech. (Sem. VI) (Main / Back) Examination, April-May 2018
Mechanical Engineering
6ME4A Vibration Engineering

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any **five questions**, selecting **one question** from each unit. All Questions carry **equal marks**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL 2. NIL

UNIT - I

- 1 (a) Explain the term loudness. How does it vary with the frequency ?
How this variation is taken into account in the subjective assessment ?
8
- (b) Write detailed note on noise standards and limits.
8

OR

- 1 What are the major industrial noise sources ? Explain various strategies used to control the industrial noise.

UNIT - II

- 2 (a) Determine the effect of the mass of the spring on the natural frequency of the system shown in the Figure 1.

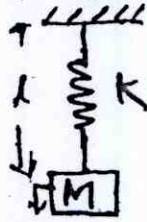


Fig-1

- (b) A spring mass system has spring constant K kg/cm and the weight of mass W kg. It has natural frequency of vibration as 12 cycles/sec. An extra 2 kg weight is coupled to W and natural frequency reduces by 2 cycles/sec. Determine weight W .

8

OR

- 2 (a) A body of 5 kg is supported on the spring of stiffness 200 N/m and has dashpot connected to it which produces a resistance of 0.002 N at a velocity of 1 cm/sec, in what ratio will the amplitude of vibration be reduced after 5 seconds?
- (b) A torsional pendulum when immersed in air indicates its natural frequency as 200 Hz. But when it was put to vibration in vacuum having no damping, its natural frequency was observed as 250 Hz. Find the value of damping factor of the oil.

8

8

UNIT - III

- 3 (a) Show that maximum velocity of vibration of spring mass dashpot system which occurs at resonance and independent of damping.
- (b) A machine having mass 100 kg and supported on springs of total stiffness 7.84×10^5 N/m has an unbalanced rotating element which results in a disturbing force 392 N at speed 3000 rpm assuming damping factor $\epsilon = 0.20$. Determine
- the amplitude motion due to unbalance
 - Transmissibility
 - Transmitted force

8

8

OR

- 3 (a) What will be the frequency ratio when the amplitude in forced vibration is maximum? Determine the peak amplitude and corresponding phase angle. 8
- (b) A 1000 kg machine is mounted on four springs of total spring constant K and negligible damping. The machine is subjected to a harmonic external force of amplitude $F = 490$ N and frequency 180 RPM. Determine amplitude of motion and maximum force transmitted to the foundation due to unbalance force, when $K = 1.96 \times 10^6$ N/m. 8

UNIT - IV

- 4 (a) An electrical motor generator set is shown in Fig. 2. Find the natural frequencies and amplitude and mode shapes. 8

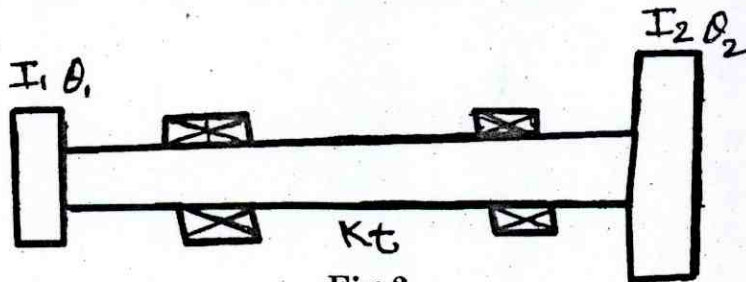


Fig-2

- (b) A two degree freedom system shown in Fig. 3. Determine the governing equation of motion for the system, two natural frequencies of vibrations and the ratio of amplitudes of the motion of M_1 and M_2 for the two modes of vibration. Given data $M_1 = 1.5$ kg, $M_2 = 0.80$ kg $K_1 = K_2 = 40$ N/m. 8

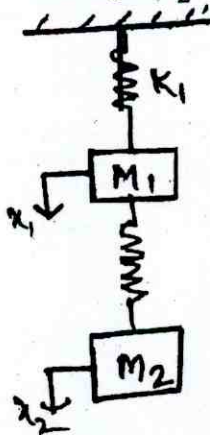


Fig-3

OR

- 4 (a) Explain the principle and working of ring torsional absorber. 8
- (b) The flywheel of an engine dynamo weighs 150 N and has radius of gyration of 25 cm. The shaft at the flywheel end has an effective length of 22 cm and is 4.5 cm in diameter. The armature weighs 90 N and radius of gyration is 20 cm, diameter 4 cm and effective length of 18 cm. neglecting the inertia of the shaft and coupling: Calculate torsional frequency and node position. Take $G = 0.84 \times 10^6 \text{ kgs/cm}^2$. 8

UNIT - V

- 5 (a) Explain following methods :
- (i) Hozer's method
 - (ii) Stodola's method

16

OR

- 5 A three degree of freedom system is shown in Fig.4. Determine the natural frequencies and plot the modes shapes for the system.

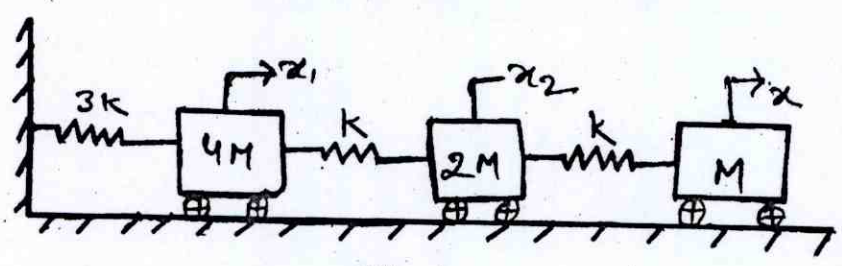


Fig-4

16

6E7015

Roll No. _____

Total No. of Pages : 4

6E7015

B. Tech. (Sem. VI) (Main & Back) Examination, April-May 2018
 Mechanical Engineering
 6ME5A Steam Engineering

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit.

All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)*

1. Steam Table 2. NIL

UNIT - I

- 1 (a) Describe in detail the working principle of any high pressure boiler with neat and clean diagrams. 8
- (b) Explain with neat sketch the working of any fire tube boiler. 8

OR

6E7015]

1

[P.T.O.

- 1 (a) Describe briefly various types of artificial draught systems used in steam boilers indicating their main advantages.

8

- (b) Describe the working principle of economizers with the help of diagrams.

8

UNIT - II

- 2 (a) What is the importance of mach number in the design of diffusers and nozzles ? Verify your answer with the help of any example.

8

- (b) Design a convergent divergent nozzle for the following data :

Initial steam pressure = 13 bar, final pressure of steam = 4 bar, steam temperature at inlet = 300°C, Quantity of steam = 1.2 kg/s, nozzle efficiency = 0.86.

8

OR

- 2 (a) Derive an expression for maximum discharge through convergent divergent nozzle for steam.

8

- (b) Dry saturated steam enters a nozzle at a pressure of 10 bar and with an initial velocity of 90 m/s. The outlet pressure is 6 bar and the outlet velocity is 435 m/s. The heat loss from the nozzle is 9 kJ/kg of steam flow. Calculate the dryness fraction and the area at the exit, if the area at inlet is 1256 mm².

8

UNIT - III

- 3 (a) Explain the process and purpose of reheating steam in steam turbine application. 6
- (b) Describe regenerative feed heating as used in thermal power plants. List its advantages. 5
- (c) Explain in detail the purpose of bleeding in steam turbines. 5

OR

- 3 (a) Derive the condition for maximum efficiency of an impulse turbine. 8
- (b) In a certain stage of an impulse turbine, the nozzle angle is 20° with the plane of the wheel. The mean diameter of the blade ring is 2.8 meters. It develops 55 kW at 2400 rpm. For nozzles, each of 10 mm diameters expand steam isentropically from 15 bar and 250°C to 0.5 bar. The axial thrust is 3.5 N. Calculate
- (1) Blade angles at entrance and exit
 - (2) Power lost in blade friction.
- 8

UNIT - IV

- 4 (a) Derive the expression for efficiency in case of reaction turbine and explain why reaction turbine is called 50% reaction turbine. 8
- (b) How enthalpy can be dropped by various stages of reaction turbine? Explain. 8

OR

- 4 (a) What do you understand by regenerative feed heating cycle ? 8
- (b) Explain the difference between ideal and actual regenerative cycles by showing the process on T-s and h-s diagram. 8

UNIT - V

- 5 (a) What are the advantages and disadvantages of reheat steam ? 8
- (b) Explain the principles of operation of different types of jet condensers. Describe with a sketch a low level jet condenser of the counter flow type. 8

OR

- 5 (a) Explain the working of binary vapour cycle with the help of diagrams. 8
- (b) What do you know about :
- (i) Pass out turbine
 - (ii) Condensers
 - (iii) By product power cycle.
- 8

6E7016

Roll No. : _____

Total Printed Pages : **3****6E7016**

B. Tech. (Sem. VI) (Main & Back) Examination, April-May 2018
Mechanical Engineering
6ME6.1A Non Destructive Evaluation & Testing

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL2. NIL**UNIT - I**

- 1 (a) Explain Non-Destructive Testing (NDT) methods and explain its various objectives. List various NDT methods and briefly explain any two. 8
- (b) Describe the different factors that influences the reliability of Non-Destructive Evaluation. 8

OR

- 1 (a) Explain the principle of visual inspection and its applications. 8
- (b) Explain liquid penetrant testing with its limitations and applications. 8

UNIT - II

- 2 (a) Define Radiographic Sensitivity (RS) and discuss the variables affecting RS. 8
- (b) Describe the film processing, interpretation and evaluation of test results in radiography testing method. 8

OR

- 2 (a) What are the general procedure of radiography ? 8
- (b) Describe the X ray film processing. 8

UNIT - III

- 3 (a) How ultrasonic NDT can be used for the tube inspection ? 8
- (b) What is scanning ? Also explain its types. 8

OR

- 3 (a) Explain the variables affecting on ultrasound testing. 8
- (b) Explain the principle of wave propagation with a suitable example. 8

UNIT - IV

- 4 Explain Magnetic Particle Inspection (MPI) technique with the help of a neat sketch. 16

OR

- 4 Explain the following :
 (a) Acoustic Emission Testing
 (b) Thermography

8×2=16

292

UNIT - V

- 5 (a) What do you mean by eddy current and discuss theory of eddy current NDT. 8
- (b) Mention the advantages and disadvantages of standard specification and codes. 8

OR

- 5 (a) Discuss the factors affecting eddy current NDT. 8
- (b) Define the following :
- (i) Standardization
 - (ii) Calibration

4×2=8

Roll No. _____

Total No. of Pages : 3

6E7018

6E7018

B. Tech. (Sem. VI) (Main & Back) Examination, April-May 2018
 Mechanical Engineering
 6ME6.3A Maintenance Management

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit.

All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)*

1. NIL 2. NIL

UNIT - I

1 (a) Define the objectives of maintenance management and also explain the scope of maintenance management.

8

(b) Explain the 8 pillars of TPM.

8

OR

1 (a) Explain human reliability and the problem occur during working in industry with suitable example.

8

(b) What is role of TPM in maintenance management and what are the objective also explain how its different from TQM ?

8

UNIT - II

- 2 (a) What do you understand by planned and unplanned maintenance ? 8
- (b) Give the comparison between preventive and breakdown maintenance. 8

OR

- 2 (a) Explain spare part management and inventory control. 8
- (b) Explain computerized management system in terms of short and long term goals. 8

UNIT - III

- 3 (a) Explain in detail the repair methods of basic machine element. 8
- (b) Explain how different wear mechanism effects efficiency of parts in terms of a petroleum company. 8

OR

- 3 (a) Explain with a suitable example the logical fault location and sequential fault diagnosis method. 8
- (b) Define the role of friction in maintenance and also define the term tribology with its applications. 8

UNIT - IV

- 4 Define the following :
- (a) Vibration analysis
- (b) Acoustic analysis
- (c) OIL analysis
- (d) Thermal Signature

4×4=16

OR

- 4 (a) Explain 'Data base design' with its various phases. 8
- (b) Define intelligent maintenance system and write down its application. 8

UNIT - V

- 5 Explain the RAM terminology and the factors affecting RAM. Also write down the importance of RAM with a suitable example of industry. 16

OR

- 5 (a) Write short notes on : 5×2=10
- (i) MTTF
- (ii) MTBF
- (b) What is reliability and its importance with respect to maintenance management. 6
-

6E3050

Roll No. : _____

Total Printed Pages : 4**6E3050**

B. Tech. (Sem. VI) (Main / Back) Examination, April-May - 2018
Mechanical Engg.
6ME2I.C. Engines & Diesel Power Plant

Time : 3 Hours]

[Maximum Marks : 80

[Min. Passing Marks : 24

Attempt any five questions, selecting one question from each unit.

All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

*Use of following supporting materials is permitted during examination.
 (Mentioned in form No. 205)*

1. NIL2. NIL**UNIT - I**

- 1 (a) Describe with a suitable sketch the 2-stroke cycle SI engine. How its indicator diagram differ from that of 4-stroke cycle engine?

8

(b) Define :

- (i) Indicated thermal efficiency
- (ii) Mechanical efficiency and
- (iii) Brake thermal efficiency.

What is the relation between the three ?

8

OR

6E3050]

1

[P.T.O.

A test on a single cylinder, 4-stroke engine having bore 18 cm and stroke 36 cm yielded the following results; speed 285 rev/min; break torque, 393 Nm i.m.e.p. 7.2 bar; fuel consumption 3.5 kg/hr; cooling water flow 4.5 kg/min; cooling water temperature rise 36°C; air-fuel ratio of mass 25; exhaust gas temperature 415°C; pressure 1.013 and room temperature 21°C.

The fuel has a calorific value of 45200 kJ/kg and contains 15% by mass of hydrogen. Determine

- (i) The Indicated thermal efficient
- (ii) The volumetric efficiency
- (iii) Draw up a heat balance in terms of kJ/min explaining clearly the content of such term. Take $R = 0.287$ kJ/kgK. C_v for dry exhaust gases = 1.005 kJ/kgK and for superheated steam $C_p = 2.05$ kJ/kgK.

16

UNIT - II

- (a) What is ignition lag ? Discuss the effect of engine variables on ignition lag.

8

- (b) What is meant by combustion induced swirl ? Show with sketches two important designs of CI combustion chamber using this method of swirl.

8

OR

- (a) What is meant by 'delay period' ? It is usually divided into two parts. Name and describe them.

8

- (b) Discuss the suitability of following fuels in diesel engines (i) Alcohols (ii) Vegetable oils (iii) Biogas.

8

UNIT - III

3 (a) Describe with sketch following types of carburettors :

- (i) Solex carburettor
- (ii) Simple float type carburettor
- (iii) Carter Carburettor.

16

OR

3 (a) Describe a high tension magneto ignition system and compare its advantages and disadvantages with a coil ignition system.

8

(b) Draw a typical heat release diagram of diesel engine and discuss its salient points.

8

UNIT - IV

4 Define and differentiate between

- (i) Boundary lubrication
- (ii) Hydrodynamic lubrication
- (iii) Elasto hydrodynamic lubrication.

16

OR

4 (a) Explain with suitable sketches the following scavenging systems :

- (i) Uniflow scavenging
- (ii) Cross-flow scavenging.

8

(b) Describe Miller supercharging.

8

UNIT - V

- 5 (a) Describe with a sketch a dual-fuel engine and comment on its performance. 8
- (b) What constitutes a 'free piston engine' ? Why it is called 'free piston' ?
What is free piston gasifier ? 8

OR

- 5 (a) What constitutes a 'free piston engine' ? Why it is called 'free piston' ?
What is free piston gasifier ? 8
- (b) What are the requirements for the installation of diesel power plant ? 8
-

Total Printed Pages : 3

6E3051

6ME3(O) Manufacturing Science & Technology

[Min. Passing Marks : 26

Units of quantities used / calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

2. Nil

UNIT - I

- 1 (a) What are the main differences between a jig and fixtures ?
- 8
- (b) Explain various types of milling fixtures and jig bushes with their merits and demerits.

OR

- 1 (a) Write short note on broaching fixture and assembly fixture. 8
- (b) What do you understand by the principle of locating and clamping devices ?
What is the six points location principle ?

UNIT - II

- (a) Explain specific applications of new machining methods. 8
- (b) What are the differences between conventional and non-conventional machining methods ? Explain abrasive jet machining. 8

OR

- (a) Explain working of electron beam machining with neat sketch. 8
- (b) Explain electro discharge machining with its advantages, disadvantages and applications. 8

UNIT - III

- (a) Explain the 'three wire method' of checking the pitch diameter of a screw. 8
- (b) Define comparator, what are their types ? Explain the working of a pneumatic comparator with neat sketch. 8

OR

- (a) How the slope of an object can be measured with the help of sine bar and slip gauges ? Explain with neat sketch. 8
- (b) Explain the various elements of surface roughness. Discuss various methods of evaluating the surface roughness in brief. 8

UNIT - IV

- 4 (a) Discuss the various types of cutting tools. 8
- (b) Why large rake angles cannot be used on cutting tools ? 8

OR

- 4 (a) How a single point cutting tool is designated ? What is the role of each cutting tool angle in cutting operation ? 8
- (b) Derive the force and power consumption relationship during milling operation. 8

UNIT - V

- 5 (a) List the properties which should be possessed by machine tool parts for their pr. per performance. 8
- (b) What are the principle requirements of guide ways ? 8

OR

- 5 (a) Which is the best section for machine body ? Justify your answer. 8
- (b) List the principle requirements for machine tool. 8

Roll No. _____

Total No. of Pages : 4

6E3053

6E3053

B. Tech. (Sem. VI) (Back) Examination, April-May 2018

Mechanical Engineering

6ME5(O) Hydraulics Machines & Hydroelectric Power Plant

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

*Attempt any five questions, selecting one question from each unit.**All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.**Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL 2. NIL

UNIT - I

- 1 (a) What is Specific speed of turbine ? Derive an expression for specific speed of turbine. 8
- (b) Define the term impact of jets. Derive an expression of work done for a curved radial vane. 8

OR

- 1 (a) What are unit quantities ? Derive relation of the unit quantities for turbine. Why are they important ? 8

- (b) A jet of water diameter 10 cm, strikes a flat plate normally with a velocity of 15 m/s. The plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find :
- The force exerted by the jet on the plane.
 - Work done by the jet on the plate per second.
 - Power and efficiency of the jet.

8

UNIT - II

- (a) Describe briefly the functions of various main components of Pelton turbine with neat sketches.

8

- (b) A pelton wheel is to be designed for the following specifications :
 Shaft Power = 11772 kW, Head = 380 m, Speed = 750 rpm, Overall efficiency = 86%, Jet diameter is not to be exceed one sixth of the wheel diameter. Determine :
- The wheel diameter
 - The number of jet required
 - Diameter of the jet
 - Take $C_v = 0.985$ and speed ratio is 0.45.

8

OR

- (a) How will you classify the turbines ? Discuss the following terms :
- Speed ratio
 - Jet ratio
 - Breaking jet

8

- (b) The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is $2.0 \text{ m}^3/\text{s}$. The angle of deflection of the jet is 165° . Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel take speed ratio equal to 0.45 and $C_v = 1.0$.

8

UNIT - III

- 3 (a) What do you know about draft tube ? why it is used in reaction turbine ? Derive an expression for draft tube theory.

8

- (b) A Kaplan turbine develops 24647.6 kW power at an average head of 39 meters. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine.

8

OR

- 3 (a) What are the causes and prevention methods of cavitation in turbine ? Also prove that $\sigma_c = (H_c - H_{\min} - H_s) / H$.

8

- (b) A reaction turbine works at 450 rpm under a head of 120 meters. Its diameter at inlet is 120 cm and the flow area is 0.4 m^2 . The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Assume whirl at outlet is zero. Determine :

- (i) The volume flow rate
(ii) The power developed

8

UNIT - IV

- 4 (a) With neat sketches discuss the principle and working of a hydraulic press.

8

- (b) A double acting reciprocating pump running at 50 rpm, delivers 8.4 liters/sec of water. The diameter of piston is 150 mm and stroke length 300 mm, the static head of pump is 25m. The suction pipe is 5m long and 100 mm in diameter. Find the percentage slip and power required to run the pump. Also calculate the acceleration head the beginning of the suction stroke.

8

OR

- 4 (a) Discuss the working of air lift pump with neat sketches. 8
- (b) Prove that for single acting reciprocating pump the ratio of work done against friction without air vessel is given by $\left[\frac{2\pi^2}{3} \right]$. 8

UNIT - V

- 5 (a) Give the advantages and disadvantages of hydraulic power plant over other methods of power generation. 8
- (b) What are the various component of hydroelectric power station ? Explain with the help of neat and clean diagrams and layout. 8

OR

- 5 (a) What do you mean by hydrographs ? Explain with the help of sketches. 8
- (b) The following data refers to a proposed hydro-electric power plant :
 Available head = 27m, Catchment area = 430Km², Rainfall = 150cm/year,
 Turbine efficiency = 80%, Generator efficiency = 86%, Load Factor = 0.45,
 Penstock efficiency = 95%, Percentage of total rainfall utilized = 65%
 Calculate the power developed. 8

6E3054

Roll No. : _____

Total Printed Pages : 7**6E3054**

B. Tech. (Sem. VI) (Back) Examination, April-May 2018
Mechanical Engineering
6ME6(O) Numerical Methods & Applied Statistics

Time : 3 Hours**Maximum Marks : 80****Min. Passing Marks : 26**

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used / calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)*

1. _____

2. _____

UNIT - I

- 1 (a) If $v = \frac{1}{2} \left(\frac{r^2}{h} + h \right)$ and the error in v is at the most 0.4%. Find the

percentage error allowable in r and h when $r = 5.1$ cm and $h = 5.8$ cm.

8

- (b) Apply Graffe's root squaring method to solve the equation

$$x^3 - 8x^2 + 17x - 10 = 0$$

8

OR

- a) By using the bisection method find an approximate root of the equation

2

$\sin x = \frac{1}{x}$, that lies between $x=1$ and $x=1.5$ (measured in radians) carry

out computations up to 7 iterations.

8

- b) Find the root of the equation $xe^x = \cos x$ using the secant method correct to four decimal places.

8

UNIT - II

- a) Determine the largest eigen value and the corresponding eigen vector of the following matrix :

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

3

8

- (b) Determine $f(x)$ as a polynomial in x for the following data :

x	-4	-1	0	2	5
$f(x)$	1245	33	5	9	1335

then find for $f(3)$.

8

OR

2

[P.T.O.

6E30

- 2 (a) Apply Bessel's formula to obtain y_{25} , given $y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$; $y_{32} = 3992$.

8

- (b) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface :

$x = \text{height}$	100	150	200	250	300	350	400
$y = \text{distance}$	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when (i) $x = 218 \text{ ft}$ and (ii) $x = 410 \text{ ft}$.

8

UNIT - III

- 3 (a) Evaluate $\int_2^4 (x^2 + 2x) dx$ by Gauss Quadratic formula.

8

- (b) A rod is rotating in a plane. The following table gives the angle θ (radians) through which the rod has turned for various values of time t (seconds)

t	0	0.2	0.4	0.6	0.8	1.0
θ	0	0.12	0.49	1.12	2.02	3.20

Calculate the angular velocity and the angular acceleration of the rod when $t = 0.6$.

8

OR

(a) Using Adams - Bashforth Predictor - corrector method, find $y(1.4)$

given that $x^2 y' + xy = 1$; $y(1) = 1$, $y(1.1) = 0.996$; $y(1.2) = 0.986$,

$y(1.3) = 0.972$.

8

(b) Use Paylor's series method to find the numerical solution of the

$$\frac{dy}{dx} = x^2 + y^2 \text{ with } x = 1, y = 0 \text{ at } x = 1.3.$$

8

UNIT - IV

(a) The first moments of a distribution about the value 4 of a variable are -1.5 , 17 , -30 and 108 . Find

(i) Moments about mean, β_1 and β_2 . Also give the nature of distribution.

(ii) Moments about origin

(iii) Moments about the point $x = 2$.

6

(b) Eight coins are tossed at 256 times. Find expected frequencies and also find the mean and variance.

5

- (c) In a city X, 20% of a random sample of 900 school boys had defective eye sight. In another large city Y, 15.5% of a random sample of 1600 school boys had the same defect. Is this difference between the two populations significant ?

5

OR

- 4 (a) Define the normal distribution. If the height of 300 students are normally distributed with the mean 66.5 inches and standard deviation 3.3 inches, now many students have height (i) less than 5 feet, (ii) between 5 feet and 5 feet 9 inches. Also, find the height between which 99% of the students lies.

6

- (b) A machine puts out 16 imperfect articles in a sample of 500. After machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved ?

5

- (c) A telephone exchange receives on an average 4 calls per minute. Find the probability on the basis of Poisson distribution ($m = 4$) of -

(i) 2 or less calls per minute

(ii) upto 4 calls per minute

(iii) more than 4 calls per minute ($e^{-4} = 0.0183$)

5

UNIT - V

- (a) Two independent samples of sizes 8 and 7 contained the following values

Sample 1 :	19	17	15	21	16	18	16	14
Sample 2 :	15	14	15	19	15	18	16	

Is the difference between the sample means significant ?

8

- (b) Calculate the correlation coefficient for the following heights (in inches) of father (x) and their sons (y)

x:	65	66	67	67	68	69	70	72
y:	67	68	65	68	72	72	69	71

8

OR

- (a) Twelve dice were thrown 4096 times and a throw of 6 was considered a success. The observed frequencies were as given below :

Number of Success :	0	1	2	3	4	5	6	7 and over
Frequency	447	1154	1180	796	380	115	25	8

Test whether the dice were unbiased.

8

(b) For the following data :

$x:$	1	2	3	4	5
$y:$	2	5	3	8	7

Find the standard error of estimate of y on x .

8