6E7011

Roll No. ____________ Total No of Pages: 4

6E7011
B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016
Mechanical Engineering
6ME1A Design of Machine Elements-II
Common with AE, ME, PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*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 may 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. Design Data Book 2. NIL

UNIT-I

Q.1 (a) What is physical significance of notch sensitivity factor being one and zero. [4]

(b) What is fluctuating stress? Draw stress – time curve for fluctuating stress.[2+2=4]

(c) A bolted assembly is subjected to an external force, that varies from 0 to 10 KN. The combined stiffness of the parts, held together by the bolt, is three times the stiffness of the bolt. The bolt is initially so tightened that at 50% overload condition the parts held together by the bolt are just about to separate. The bolt is made of plain carbon steel 50 C4. The fatigue stress concentration factor is 2.2 and the expected reliability is 90%. The factor of safety is 2. Determine the size of the bolt with fine threads. [8]

OR

Q.1 (a) Explain modified Goodman diagram for bending stresses? [6]

(b) What is the difference between failure due to static load and fatigue failure? [2]

(c) A transmission shaft carries a pulley midway between the two bearings. The bending moment at the pulley varies from 200N – M to 600 N – M, as the tore zonal moment in the shaft varies from 70 N – M to 200 N – M. The frequencies of variation of bending and tore zonal moments are equal to the shaft speed. The shaft is made of steel FeE 400. The corrected endurance limit of the shaft is 200 N/mm^2. Determine the diameter of the shaft using a factor of safety of 2. [8]

UNIT-II

Q.2 Design a plain carbon steel crank shaft for a 0.40m by 0.60m single acting 4 stroke single cylinder engine to operate at 200 r. p. m. The mean effective pressure is 0.49 MPa, and the maximum combustion pressure is 2.625 Mpa. At maximum tensional moment, when the crank angle is 36°, the gas pressure. is 0.975 MPa. The ratio of the connecting rod length to the crank radius is 4.8. The flywheel is used as a pulley. The weight of the flywheel is 54.50 KN and the total belt pull is 6.75 KN. Assume suitable values for the missing data. [16]

OR

Q.2 (a) What are the desirable properties of a piston in I.C. engine? [4]

(b) Determine the thickness of a cost iron cylinder wall and the stresses for a 300mm petrol engine, with a maximum gas pressure of 3.5 N/mm^2 [6]

(c) A vertical 4 – stroke C.I. engine has the following specifications :-
Break Power = 4.5 kw, speed = 1200rpm.
Indicated mean effective pressure = 0.35 N/mm^2 & η_m = 0.80 Determine the dimensions of the cylinder. [6]

UNIT-III

Q.3 (a) It is required to design a helical torsion spring for a window shade. The spring is made of patented and cold – drawn steel wire of grade – 4. The yield strength of the material is 60% of the ultimate tensile strength and the factor of safety is 2.
From space considerations, the mean coil diameter is kept as 18mm. The Maximum bending moment acting on the spring is 250 N – mm. Determine the wire diameter and the number of active coils.
Take $E = 207 \times 10^3$ N/mm^2 & K (stiffness of spring) = 3 N – mm/rad. [8]

(b) A helical tension spring is used in the spring balance to measure the weights. One end of the spring is attached to the rigid support while the other end, which is free, carries the weights to be measured. The maximum weight attached to the spring balance is 1500 N and the length of the scale should be approximately 100 mm. The spring index can be taken as 6. The spring is made of oil – hardened and tempered steel wire with ultimate tensile strength of 1360 N/mm^2 and modules of rigidity of 81370 N/mm^2. The permissible shear stress in the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate : [8]

(i) Wire diameter

(ii) No. of active coils

(iii) Required spring rate: and

(iv) Actual spring rate.

OR

Q.3 Design an open flat belt drive to connect horizontal shaft at 4.5m centre distance velocity ratio of deriver / driven pulleys is 2.5. Speed of smaller pulley is 960 rpm. Nominal power transmission is 20kw under very light shock. [16]

UNIT-IV

Q.4 (a) A pair of worm and worm wheel is designated as 3/60/10/6. The worm is transmitting 5kw power at 1440 rpm to the worm wheel. The co - efficient of function is 0.1 and the normal pressure angle is 20. Determine the components of the gear tooth force acting on the worm and worm wheel. [10]

(b) Derive the expression for beam strength of a gear tooth. [6]

OR

Q.4 (a) Design a pair of equal diameter, 20° stud tooth helical gears to transmit 37.5 kw with moderate shock at 1200rpm. The two shafts are parallel and 0.45m a port. Each gear is to be of steel. Find the module and face width of the teeth. [10]

(b) A C. I. bevel gear has a module of 2.5mm and its pitch diameter is 0.60m. The angle is 30° and the teeth are 20° full depth. Determine the permissible endurance load. [6]

UNIT-V

Q.5 (a) A single deep – groove ball bearing is subjected to a radial force of 8KN and a thrust force of 3KN. The shaft rotates at 1200rpm. The expected life L_{10h} of the bearing is 20000hr. The minimum acceptable diameter of the shaft is 75mm. Select a suitable ball bearing for this application. [8]

(b) Explain the method of lubrication in detail. [8]

OR

Q.5 (a) A taper roller bearing has a dynamic has a dynamic load capacity of 26KN. The desired life for 90% of the bearings is 8000hr and the speed is 300rpm. Calculate the equivalent radial load that the bearing can carry. [4]

(b) Following data is given for a 360° hydrodynamic bearing : Radial load = 10KN, Journal speed = 1440 rpm, unit bearing pressure = 1000kpa, clearance ratio (r/c) = 800; viscosity of lubricant = 30mpas. Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing.

Calculate:- [6×2=12]

(i) Dimensions of bearing;

(ii) Co – efficient of friction;

(iii) Power lost in friction;ss

(iv) Total flow of oil;

(v) Side leakage; and

(vi) Temperature rise.

6E7012

Roll No. ____________ Total No of Pages: 3

6E7012
B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016
Mechanical Engineering
6ME2A Newer Machining Methods

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*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 may 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

Q.1 (a) Explain the reasons why unconventional machining methods are used. [6]

(b) Explain the Abrasive Flow Machining (AFM) with a neat sketch. [10]

OR

Q.1 (a) Give a comparison of the unconventional processes in terms of process, material removal rate and applications. [6]

(b) Explain the principle of operation of a Magnetic Abrasive Finishing (MAF) with neat sketch. Also highlight its applications and limitations. [10]

UNIT-II

Q.2 (a) Briefly explain the construction and working of an ultrasonic machining unit a neat sketch. [8]

(b) State the advantages, limitations and applications of ultrasonic machining (USM). [8]

OR

Q.2 (a) What is the principal of operation of Water Jet Machining (WJM) ? Explain briefly with a neat sketch. [6]

(b) Discuss graphically the variation of Metal Removal Rate (MRR) in Abrasive Jet Machining (AJM) process with respect of following process parameters: [6]

(i) Nozzle tip distance (NTD)

(ii) Mixing Ratio

(iii) Abrasive Mass Flow Rate.

(c) Give typical engineering applications of AJM. [4]

UNIT-III

Q.3 (a) Explain in detail the working and constructional features of an electric discharge machining (EDM) unit with a neat sketch. [8]

(b) During an electric discharge drilling of a 10mm square hole in a low carbon steel plate of 5mm thickness brass tool and Kerosene are used. The resistance and the Capacitance and the capacitance in the relaxation circuit are 50Ω and 10μ F, respectively. The supply voltage is 200volts and the gap is maintained at such a value that the discharge (sparing) takes place at 150 volts. Estimate the time required to complete the drilling operation. [8]

OR

Q.3 (a) Compare Laser Beam Machining (LBM) and Electron Beam Machining (EBM) in terms of process parameters, equipment and applications. [8]

(b) Explain with a neat sketch the construction and working of a Plasma Arc Machining (PAM). [8]

UNIT-IV

Q.4 (a) Differentiate between Electro – Chemical Machining (ECM) and chemical machining (CHM). [8]

(b) Composition of a Nickel super alloy is as follows:

Ni = 70.0%, Cr = 20.0%, Fe = 5.0% and rest Ti calculate rate of dissolution (mm^3/min) if the area tool is 1200mm^2 and a current of 1500A is being passed through the cell. Assume dissolution to take place at lowest valiancy of the elements. Atomic weight (A), density (P), and valiancy (v) of different constituents of super alloy are as mentioned below: [8]

A_{Ni}	=	58.71	P_{Ni}	=	8.9	V_{Ni}	=	2
A_{Cr}	=	51.99	P_{Cr}	=	7.19	V_{Cr}	=	2
A_{Fe}	=	55.85	P_{Fe}	=	7.86	V_{Fe}	=	2
A_{Ti}	=	47.9	P_{Ti}	=	4.51	V_{Ti}	=	3

OR

Q.4 (a) Explain briefly the process parameters that affect the metal removal rate (MRR) and surface Quality in ECM. [8]

(b) What factors should be considered is selecting the tool materials in ECM? [4]

(c) State the advantages, limitations and applications of ECM. [4]

UNIT-V

Q.5 Explain in detail the nanoscale cutting process. Also highlight the typical advantages, applications and limitations of the process. [16]

OR

Q.5 Write brief notes on: [4×4=16]

(a) Micro turning

(b) Micro drilling

(c) Micro milling

(d) Micro grinding

/oo

6E7013	Roll No. ____________	Total No of Pages: 3

6E7013
B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016
Mechanical Engineering
6ME3A Mechatronics
Common with ME, PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

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 may 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

Q.1 (a) Explain merits and demerits of mechatronic system with suitable example. [8]

(b) Describe process control Automation in detail. [8]

OR

Q.1 (a) Explain flexible Manufacturing system in detail. [8]

(b) What are the key elements of any mechatronic system? Explain it's elements in brief. [8]

UNIT-II

Q.2 (a) Describe the working of linear displacement transducers with suitable diagrams. [8]

(b) What is the significance of actuators in equipments? Also define classification of actuators. [8]

OR

Q.2 (a) An LVDT is used in an accelerometer to measure seismic mars displacement. The LVDT and signal conditioning output are 0.31mV /mm with a ±20 mm core displacement. The spring constant is 240N/m and the core mass is 0.05 kg. Find

(i) Relation between acceleration in m / s^2 and the output voltage

(ii) Natural frequency

(iii) Maximum acceleration measureable [5]

(b) What are the selection crieterias of any transducer? [6]

(c) Write short note on flow sensoe [5]

UNIT-III

Q.3 (a) Differentiate between open loop and closed loop systems. [8]

(b) Describe working and application of neural networks with suitable examples. [8]

OR

Q.3 (a) Explain the role of control in mechatronics design. [8]

(b) What are the operations used in digital signal processing? Also explain the digital signal processing fore mechatronic application. [8]

UNIT-IV

Q.4 (a) Describe analog to digital conversion with suitable diagrams. [8]

(b) What do you mean by signal conditioning system? Explain the types of signal conditioning system. [8]

OR

Q.4 (a) What is a data logger? Also define it's functional requirements. [8]

(b) Explain objectives of and applications of data Acquisition system. [8]

UNIT-V

Q.5 (a) Define CNC machine in detail. [8]

(b) What are the technologies used in robot and manipulator arums? [8]

OR

Q.5 (a) What do you mean by packaging system. Also define its objectives. [8]

(b) Explain Anti – lock braking system in brief. [8]

6E7014

Roll No. ____________ Total No of Pages: 4

6E7014
B. Tech. VI-Sem. (Main & Back) Exam., April/May-2016
Mechanical Engineering
6ME4A Vibration Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*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 may 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

Q.1 (a) Discuss various methods used in controlling industrial noise. [8]

(b) Explain term loudness. How does it vary with the frequency? How this variation is taken in account in the subjective assessment. [8]

OR

Q.1 (a) What are the auditory and non – auditory effects of noise. [8]

(b) Derive an equation for finding out sound intensity at a distance r from the source of sound of known sound power level. [8]

UNIT-II

Q.2 (a) A 5 kg mass attached to the lower end of a spring, where upper end fixed, vibrates with a natural period of 0.45 sec. Determine the natural period when a 2.5 kg mass is attached to the midpoint of the same spring with upper and lower ends fixed. [8]

(b) A shaft supported freely at the ends has a mass of 100 kg placed 25 cm from one end. Find the frequency of the natural transverse vibration if the length of the shaft is 75 cm, E = 200 GN/M^2 and shaft diameter is 4 cm. [8]

OR

Q.2 (a) What do you understand by under – damped system, over damped system and critically – damped system and its use? Explain. [3+3+4=10]

(b) A vibratory system in a vehicle is to be designed with the following parameters: K = 100 N/m, c = 2N – Sec/m, m = 1 kg

Calculate the decrease of amplitude from its starting value after complete oscillations and (b) the frequency of oscillation. [6]

UNIT-III

Q.3 (a) Derive an expression for amplitude and phase angle of vibrations because of a rotating unbalance. [8]

(b) A vibrating system having mass 1 kg is suspended by a spring stiffness 1000N/m and it is put to harmonic excitation of 10 N. Assuming viscous damping, determine. [8]

(i) The resonant frequency

(ii) The phase angle at resonance

(iii) The amplitude at resonance

(iv) The frequency corresponding to the peak amplitude and Take C = 40 N – Sec/m.

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OR

Q.3 (a) An electric motor is supported on a spring and a dashpot. The spring has the stiffness 6400 N/m and the dashpot offers resistance of 500 N at 4.0 m/sec. The unbalanced mass 0.5 kg rotates at 5 cm radius and the total mass of vibratory system is 20 kg. The motor runs at 400 rpm. Determine:

(i) Damping factor

(ii) Amplitude of vibration and phase angle

(iii) Resonant speed and resonant amplitude and

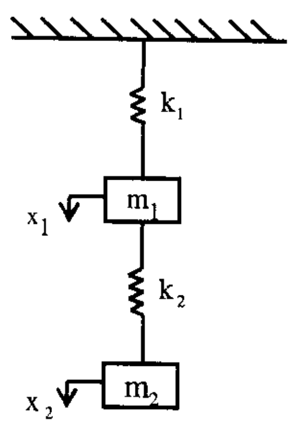
(iv) Forces exerted by the spring and dashpot on the motor. [2+3+3+2=10]

(b) A spring mass damper system is subjected to a harmonic force. The amplitude is found to be 20 mm at resonance and 10 mm at a frequency 0.74 times the resonant frequency. Find the damping ratio of system. [6]

UNIT-IV

Q.4 (a) Explain the principle of undamped dynamic vibration absorber. [8]

(b) Figure shows a vibrating system having two degree of freedom. Determine the tow the two natural frequencies of vibrations and the ratio of amplitudes of the motion of m_1 and m_2 for the two mode of vibration. [8]



OR

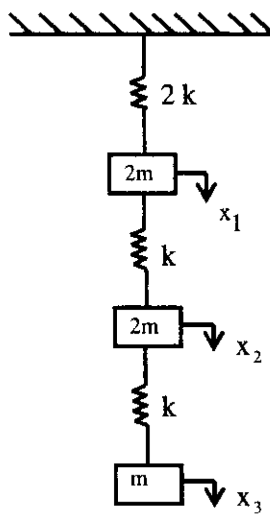
Q.4 (a) Explain principle & working of centrifugal pendulum absorber. [8]

(b) A machine runs at 5000 rpm. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is to at least 20% from the forced frequency, design a suitable vibration absorbed for the system. Assume the mass of the machine as 30 kg. [8]

UNIT-V

Q.5 (a) Write short note on Stodola's Method. [8]

(b) Using matrix method, Determine the natural frequencies of the system shown in figure. [8]



OR

Q.5 Derive governing equation for the torsional vibration of a shaft fixed at both end. Find the frequency equation and mode shapes for the same. [16]

6E7015

Roll No. ____________ Total No of Pages: 4

6E7015
B. Tech. VI Sem. (Main & Back) Exam., April/May-2016
Mech. Engineer
6ME5A Steam Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*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 may suitably be assumed and stated clearly.*
Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. Steam table & mollies chart
2. Property tables

UNIT-I

Q.1 (a) State how the boilers are classified? [6]

(b) Give an outline sketch showing the arrangement of water tubes and furnace of a Babcock and Wilcox boiler. Indicate on it the path of the flue gases and water circulation. Show the positions of fusible plug, blow off cock and super heater. Mention the function of each. [10]

OR

Q.2 (a) Why high pressure boiler are used? [6]

(b) What is Fluidised Bed Combustion system? Sketch and describe a Fluidised Bed Combustion (FBC) system. State the advantages of FBC system. [10]

UNIT-II

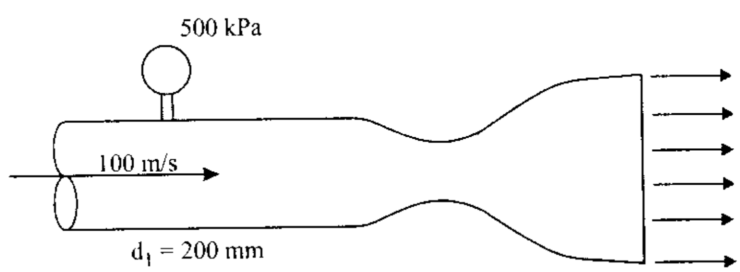
Q.3 (a) Define Mach Number. What is its significance in design of diffusers and nozzles? [6]

(b) Air enters a nozzle like that shown in Figure at a temperature of 195° C and a velocity of 100 m/s. If the air exits to the atmosphere where the pressure is 85 kPa. Find

(i) The exit temperature

(ii) The exit velocity

(iii) The exit diameter [10]



OR

Q.2 (a) Derive the expression for critical pressure ratio in case of nozzles. [8]

(b) Air at 10°C and 80 kPa enters the diffuser of a jet engine steadily with a velocity of 200 m/s. The inlet area of the diffuser is 0.4 m^2. The air leaves the diffuser with a velocity that is very small compared with the inlet velocity. Determine

(i) The mass flow rate of the air and

(ii) The temperature of the air leaving the diffuser. [8]

UNIT-III

Q.3 (a) Explain diagram efficiency and Gross stage efficiency. [6]

(b) What do you understand by compounding for pressure and velocity in case of impulse turbine? Why and how it is achieved? [10]

OR

Q.3 (a) Why governing of turbines is essential? [4]

(b) In a simple steam impulse turbine, steam leaves the nozzle with a velocity of 1000 m/s at an angle of 20° to the plane of rotation. The mean blade velocity is 60% of velocity of maximum efficiency. If diagram is 70% and axial thrust is 39.24 N/kg of steam/sec, estimate:

(i) Blade angles

(ii) Blade velocity co – efficient

(iii) Heat lost in kJ in friction per kg. [12]

UNIT-IV

Q.4 (a) What do you understand by 'degree of reaction'? [4]

(b) At a particular ring of a reaction turbine the blade speed is 67 m/s and the flow of steam is 4.54 kg/s, dry saturated, at 1.373 bar. Both fixed and moving blades have inlet and exit angles of 35° and 20° respectively. Determine:

(i) Power developed by the pair of rings.

(ii) The required blade height which is to be one tenth of the mean blade ring diameter.

(iii) The heat drop required by the pair if the steam expands with an efficiency of 80%. [12]

OR

Q.4 (a) What do you understand by regenerative feed heating cycle? [4]

(b) Explain the difference between ideal and actual Regenerative cycles by showing the process on T – s and h – s Diagram. Why actual Regenerative cycle differs from ideal Regenerative cycle? [12]

UNIT-V

Q.5 (a) What are the advantages and disadvantages of reheating of steam? [4]

(b) In a condenser test the following observations were made: [12]

Vacuum = 69 cm of Hg: Barometer = 75 cm of Hg

Mean temperature of condenser = 35°C: Hot well temperature = 28°C

Amount of cooling water = 50,000 kg/hr. Inlet temperature = 17°C

Outlet temperature = 30°C: Amount of condensate per hour = 1250kg

Find

(i) The amount of air present per m^3 of condenser volume.

(ii) The state of steam entering the condenser.

(iii) The vacuum efficiency.

R for air = 287 J/kgK.

OR

Q.5 (a) Explain the working of binary vapour cycle with a neat sketch. [8]

(b) What is condenser? Name the different types of condenser. Describe the operation of surface condenser. [8]

6E7016	Roll No. ____________ Total No of Pages: 3

6E7016
B. Tech. VI-Sem. (Main & Back) Exam., April/May-2016
Mechanical Engineering
6ME6.1A Non Destructive Evaluation and Testing
Common with PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*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 may 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

Q.1 (a) Differentiate between destructive and nondestructive evaluation. [8]

(b) Briefly explain the factors influencing the reliability of nondestructive testing. [8]

OR

Q.1 Explain liquid Penetrant testing with its limitations and applications. What is the role of various penetrants and developers in liquid penetrant testing? [16]

UNIT-II

Q.2 (a) Differentiate between X – ray and Y –ray radiography. [8]

(b) How defects are detected in weldments using radiographic inspection technique? [8]

OR

Q.2 Describe the X – ray film processing and reading and interpretation of radiographs in radiographic inspection. [16]

UNIT-III

Q.3 Briefly classify and discuss the ultrasonic inspection technique with neat sketch. [16]

OR

Q.3 (a) What is the importance of angle beam testing for identification of defects in welded objects in ultrasonic inspection? [8]

(b) How ultrasonic NDT can be used for thickness measurement? [8]

UNIT-IV

Q.4 Explain procedural steps of Magnetic particle Inspection technique with neat sketch. [16]

OR

Q.4 Write short notes on: [16]

(a) Acoustic Emission testing

(b) Thermography

UNIT-V

Q.5 What is the basic principle of eddy current non destructive evaluation technique? Also explain about its test system and test arrangement. [16]

OR

Q.5 Write short note on (any two) [8×2=16]

(a) Factors affecting the eddy current testing.

(b) Codes and standards used in eddy current NDT.

(c) Applications of eddy current NDT.

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6E3050

Roll No. ____________

Total No of Pages: 3

6E3050
B. Tech. VI-Sem. (Old Back) Exam., April/May-2016
Mechanical Engineering
6ME2 I.C (O) Engines & Diesel Power Plant

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

*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 may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL ____________ 2. NIL ____________

UNIT-I

Q.1 (a) Write short note on automotive pollution control system. [8]

(b) The air flow to a four cylinder four stroke petrol engine is measured by means of 7.5 cm diameter sharp-edged orifice, cd=0.6. During a test on the engine the following data were recorded -

Bore =11cm, stroke =13cm

Engine speed = 2250 rev/min

Brake power = 36 kW

Fuel consumption =10.6 kg/hr

C.V. of fuel = 42000 KJ/kg

Pressure drop across the orifice = 4.1cm of water, atmospheric temperature and pressure =15°C and 1.013bar. Calculate: [8]

(i) Break thermal efficiency

(ii) Break means effective pressure

(iii) Volumetric efficiency based on free air conditions.

OR

Q.1 (a) Explain briefly [4×2=8]

(i) Mean effective pressure

(ii) Specific fuel consumption

(iii) Indicated thermal efficiency

(iv) Volumetric efficiency

(b) Find out the speed at which a four cylinder engine using natural gas can develop a brake-power of 50kW working under following conditions – [8]

Air-gas ratio 9 : 1,

Calorific Value of the fuel – 34 MJ/M^3

Compression Ratio 10 : 1

Volumetric efficiency = 70%,

Indicated thermal efficiency = 35%,

mechanical efficiency = 80%, and

the total volume of the engine = 2liters.

UNIT-II

Q.2 (a) Describe the phenomenon of detonation and discuss different factors affecting detonation in SI engines. [8]

(b) Explain briefly the stages of combustion in CI engines. [8]

OR

Q.2 (a) What is meant by 'delay period'? Discuss the variables affecting the delay period. [8]

(b) Describe the stages of combustion in SI engine. [8]

UNIT-III

Q.3 (a) Briefly describe different types of injection systems. [8]

(b) Write short note on fixing order in engines. [8]

OR

Q.3 (a) Write short note on - [8]

(i) Fuel transfer pump

(ii) Injunction pump of a CI engine

(b) Write short note on 'MPFI system'. [8]

UNIT-IV

Q.4 (a) Why cooling of I.C. engines is essential? What are the effects of under-cooling and over cooling of an engine? [8]

(b) What is the importance of lubrication in I.C. engines? [8]

OR

Q.4 (a) "Super charging is more preferred in C.I. engine than SI engines". Discuss. [8]

(b) What is super charging? How is it achieved? What is the effect of super charging on the following parameters: [8]

(i) Power output

(ii) Mechanical efficiency

(iii) Fuel consumption.

UNIT-V

Q.5 What constitutes a 'Free-piston engine'? Why is it called 'Free-piston"? Describe with a sketch the working of a free piston engine. [16]

OR

Q.5 (a) Write short note on the Duel fuel engine. [8]

(b) Draw a neat line diagram of a diesel power plant showing all the systems. [8]

6E3051

Roll No. ____________ Total No of Pages: 4

6E3051
B. Tech. VI-Sem. (Old Back) Exam., April/May-2016
Mechanical Engineering
6ME3 (O) Manufacturing Science & Technology

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

*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 may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

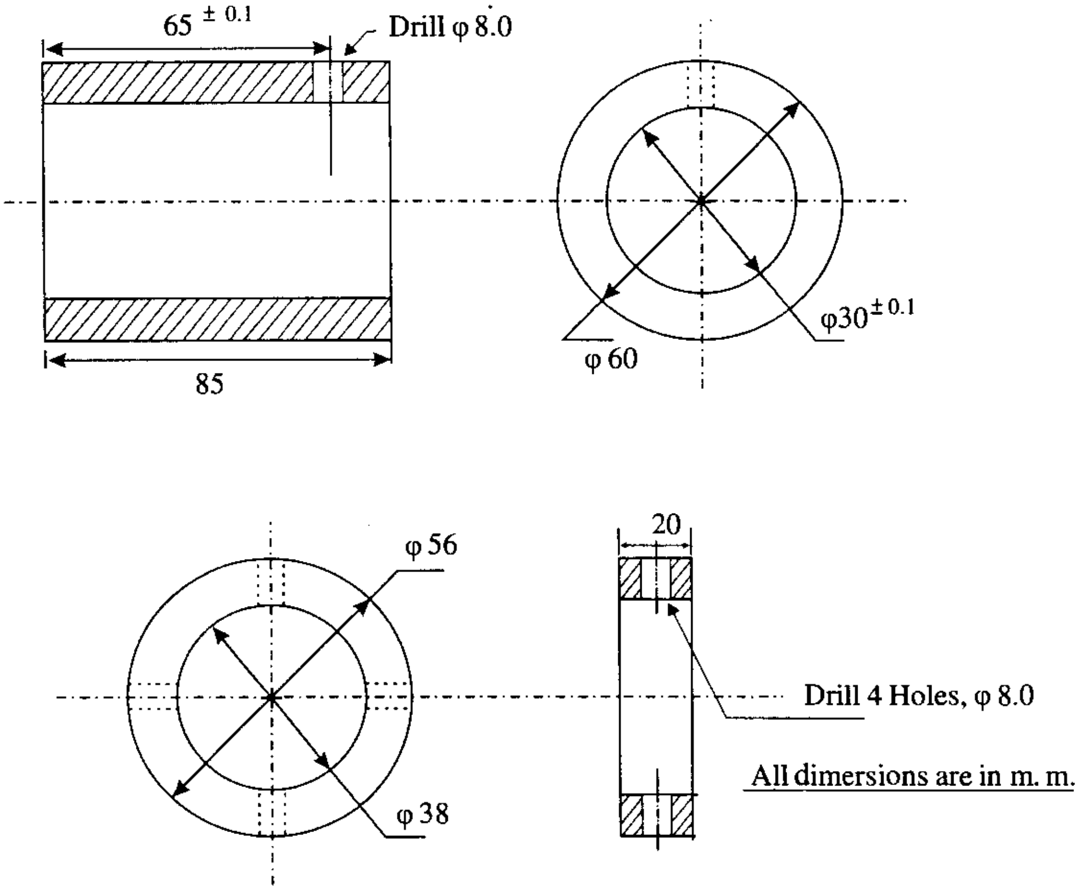
Q.1 (a) Discuss various design considerations to be kept while designing Jigs & Fixtures. [8]

(b) Explain various methods of location with neat sketches. [8]

OR

Q.1 (a) Design & draw a "Drill Jig" for any one component shown in fig.

Components are fully machined except drilling which is to be done on your designed "Drill – Jig". [10]



(b) Sketch a simple "Milling – Fixture" and name different parts of it. What is the use of a "Setting – Block"? [6]

UNIT-II

Q.2 (a) Explain Abrasive – Jet Machining process. Discuss its advantages, limitations and applications. Also discuss various factors on which M. R. R. depends. [10]

(b) Explain "Hot machining" process. [6]

OR

Q.2 (a) Explain "Electric – Discharge Machining" with neat sketch. Discuss its advantages, limitations and applications. [8]

(b) Explain "Laser Beam Machining", Discuss its advantages, limitations and applications. [8]

UNIT-III

Q.3 (a) Explain "Two – wire method" of measurement of effective dia of screw threads. Derive the formula for effective dia. What do you mean by "Best – size wire"? [10]

(b) Explain "Gear – Tooth Vernier Caliper" or "Parkinson – Gear Tester" with neat sketch. [6]

OR

Q.3 (a) Discuss various elements of surface roughness. Explain any one method of measurement of surface roughness. [8]

(b) Explain principle and working of an "Optical – Comparator". Discuss its advantages and limitations. [8]

UNIT-IV

Q.4 (a) Explain geometry of a single point cutting tool and explain function of various angles. [8]

(b) In orthogonal cutting of a M. S. bar on a lathe the feed used is 0.3 mm. per rev. and the depth of cut is 2 mm. Determine the cross section of a rectangular tool shank if the allowable stress in the shank materiel is 7 Kg/mm^2 and the cutting force can be calculated by the relation –

$Fc = 200 \times f^{0.75} \times t$

Assume any suitable data if required. [8]

OR

Q.4 (a) Explain various steps for designing of a milling cutter in detail. [10]

(b) Determine the power required by a milling cutter to take a cut 100 mm wide and 3 mm deep at 75 mm/min feed for an alloy steel. If the cutter dia is 100 mm and cutting speed is 15 m/min find the mean torque at the arbor. Take specific cutting pressure as 400 Kg/mm^2. [6]

UNIT-V

Q.5 (a) Discuss materials used for lathe bed with their advantages and disadvantages. [6]

(b) Discuss various lathe bed sections with neat sketch. [6]

(c) How stiffness of lathe beds can be improved? [4]

OR

Q.5 (a) What is the purpose of guideways? What are the principal requirements of quideways? Name and explain with neat sketches principal shapes of slideways. [10]

(b) Explain Antifriction guideways with neat sketch. [6]

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6E3053

6E3053
B. Tech. VI-Sem. (Main) Exam., April/May-2016
Mechanical Engineering
6ME5 (O) Hydraulic Machines & Hydroelectric Power Plant

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

Instructions to Candidates:-

*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 may 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

Q.1 (a) Define specific speed of a turbine. Derive the expression for the same. [8]

(b) What is the significance of non – dimensional specific speed in the study of hydraulic machines? [4]

(c) What do you understand by similarity principle and how do you apply it to hydraulic machines. [4]

OR

Q.1 (a) Prove that the work done/sec on a series of moving curved waves by a jet of water striking at one of the tips of wave is given by

Work done/sec = $\rho a V_1 [V_{w1} \pm V_{w2}] \times u$ [8]

(b) A jet of water of diameter 10cm strikes a flat plate normally with a velocity of 15m/s. The plate is moving with a velocity of 6m/s in the direction of the jet and away from the jet. Find:

(i) The force exerted by the jet on the plate

(ii) Work done by the jet on the plate per second.

(iii) Power and efficiency of the jet [8]

UNIT-II

Q.2 (a) How will you classify turbines. Define hydraulic efficiency (η_h), mechanical efficiency (η_m), volumetric efficiency (η_v) and overall efficiency (η_o) with reference to a hydraulic turbine. [8]

(b) Obtain an expression for the work done per second on a runner of a pelton turbine. Draw the inlet and outlet triangles for a pelton wheel and indicate the direction of various velocities. [8]

OR

Q.2 (a) Describe briefly the functions of various main components of pelton turbine with neat sketches. [8]

(b) Four jets each of 60mm diameter strike the buckets of an impulse wheel and each gets deflected by an angle of 165°. The speed of the bucket wheel is 45 m/s. Find the velocity of jet for maximum efficiency, power developed and the hydraulic efficiency. Assume that the bucket moves linearly. [8]

UNIT-III

Q.3 (a) Explain with a neat schematic diagram, the operation of a Francis turbine. What are its advantages? [8]

(b) What are the uses of a draft tube? Describe with neat sketches different types of draft tubes with their specific applications. [8]

OR

Q.3 (a) Draw the velocity diagrams of an inward – flow Francis turbine and derive the expression of blading efficiency in terms of wave angles. [8]

(b) Tests conducted on a one fifth scale model of a Francis turbine under a head of 1.5m indicated that it could develop 5kw power at 450rpm. Determine the speed and power of a full sized turbine while working under a head of 30m. [8]

UNIT-IV

Q.4 (a) What is a reciprocating pump. Describe the principle and working of a reciprocating pump with neat sketch. Why is a reciprocating pump not coupled directly to the motor? [8]

(b) Derive an expression for work done per second in case of a single acting reciprocating pump. [8]

OR

Q.4 (a) Explain how and when separation of flow takes place in a reciprocating pump. Discuss the preventive measures usually adopted for effective reduction of separation in such a pump. [8]

(b) Define the term hydraulic accumulator. Obtain and expression for the capacity of a hydraulic accumulator. [8]

UNIT-V

Q.5 (a) Classify dams. Enlist the advantages and disadvantages of water power. [8]

(b) Explain the following terms:

(i) Head race

(ii) Tail race

(iii) Flume

(iv) Penstock [2×4=8]

OR

Q.5 (a) What are mini and micro – hydro plants. What are their advantages and disadvantages? [8]

(b) The following data refers to a proposed hydro – electric power plant:

Available head = 27m

Catchment area = 430 sq.km

Rainfall = 150 cm/year

Turbine efficiency = 80%

Generator efficiency = 86%

Load factor = 0.45

Penstock efficiency = 95%

Percentage of total rainfall utilized = 65%

Calculate:

(i) The power developed

(ii) Suggest suitable turbine for the plant [8]

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6E3054

B. Tech. VI-Sem. (Back) Exam., April/May-2016
Mechanical Engineering
6ME6 (O) Numerical Methods and Applied Statistics

Time: 3 Hours | **Maximum Marks: 80**
Min. Passing Marks (Back): 24

Instructions to Candidates:-

*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 may 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

Q.1 (a) Find the root of the equation $lox_{10}x = \cos x$ by bisection method. [8]

(b) Using secant method, find the root of the equation $x^2 + 4\sin x = 0$. [8]

OR

Q.1 (a) Find all the roots of the polynomial equation $x^3 - 3x^2 - 6x + 8 = 0$ using the Graeffe's root squaring method. [8]

(b) Find the root of the equation $x^4 - x - 10 = 0$ near to $x = 2$ by Newton- Raphson method. [8]

UNIT-II

Q.2 (a) Solve the system of equations: [8]

$x + y + z = 9$

$2x - 3y + 4z = 13$

$3x + 4y + 5z = 40$

by using Gauss elimination method.

(b) Using Lagrange's interpolation formula, find the value of $\log_{10} 301$ for the following data: [8]

x	300	304	305	307
$\log_{10} x = f(x)$	2.477	2.482	2.484	2.4871

OR

Q.2 (a) Use Stirling formula to find y_{28} given: [8]

$y_{20} = 49225$, $y_{25} = 48316$, $y_{30} = 47236$, $y_{35} = 45926$, $y_{40} = 44306$.

(b) Using power method, compute dominant eigenvalue in magnitude and the corresponding eigenvector of the following matrix $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$. [8]

UNIT-III

Q.3 (a) Use Simpson's '1/3' and '3/8' rule to evaluate the following: [8]

$$\int_0^1 \frac{dx}{1+x}.$$

Hence obtain the approximate value to $\log_e 2$ in each case.

(b) Solve the differential equation [8]

$$\frac{dy}{dx} = x + y^2, \; y(0) = 0.$$

for $x = 0.4$ by Euler's method taking $h = 0.1$.

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OR

Q.3 (a) Evaluate $\int_{4}^{5.2} \log x \, dx$ by Trapezoidal rule. [8]

(b) Given the differential equation. [8]

$$\frac{dy}{dx} = \frac{x^2}{y^2+1},$$

with the initial condition y = 0 when x = 0, use Picard's method to obtain y for x = 0.25 and 1.0 correct to three places of decimals.

UNIT-IV

Q.4 (a) Calculate the coefficient of correlation between x and y using the following data: [8]

X:	1	3	5	7	8	10
Y:	8	12	15	17	18	20

(b) Assume a certain factory turning out razor blades, there is a small chance 1/500 for any blade to be defective. The blades are supplied in packets of 10. Use the Poisson distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 10000 packets given that $e^{-0.02} = 0.9802$. [8]

OR

Q.4 (a) Calculate rank correlation coefficient for the following data: [8]

X:	45	56	39	54	45	40	56	60	30	36
Y:	40	36	30	44	36	32	45	42	20	36

(b) Define Binomial distribution and find mean, variance and moment generating function for the same. [8]

UNIT-V

Q.5 (a) Five dice were thrown 192 times and the number of times 4, 5 or 6 were as follows: [8]

No. of dice throwing 4, 5 or 6	5	4	3	2	1	0
f	6	46	70	48	20	2

Calculate x^2.

(b) Two random variables have the following regression lines: [8]

$3x + 2y - 26 = 0$ and $6x + y - 31 = 0$

Find the mean values and coefficient of correlation between x and y.

OR

Q.5 (a) Find the Student's t for following variable values in a sample of eight: [8]

-4, -2, -2, 0, 2, 2, 3, 3

Taking the mean of the universe to be zero.

(b)Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same against that they are not, at 5% level. [8]
