B.Tech. (Mech) Sem VIII
Computational Fluid Dynamics.

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26/11/2015

BHARATIYA VIDYA BHAVAN'S

SARDAR PATEL COLLEGE OF ENGINEERING

GOVERNMENT AIDED AUTONOMOUS INSTITUTE

ANDHERI (WEST), MUMBAI - 400 058.

End Semester Exam

Nov – Dec 2015

Max. Marks: 100	**Duration: 03 hrs**
Class: B.Tech Mechanical	**Semester: VIII**
Name of Course: Elective – I **Computational Fluid Dynamics**	**Program: B.Tech Mechanical Engineering**
Course Code: ME - 408	
Instructions: 1. Question no. 1 is Compulsory **2. Attempt any four questions out of remaining six.** **3. Figures to right indicate full marks** **4. Assume suitable data if necessary** Master file.	

Q. 1 (a) Write Short Notes on: 10

(i) Modelling

(ii) Simulation

(b) Explain the CFD Methodology? 10

Q. 2 (a) Derive the Momentum Equation for an infinitesimally small moving fluid element. State all the assumptions made clearly. 10

(b) Explain different types of Boundary Conditions with example. 06

(c) State how many boundary conditions and initial conditions are required from the below given governing equations: 04

i) $\frac{\partial T}{\partial t} + \frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} = 0$

ii) $\frac{d^2T}{dx^2} = \frac{hP}{KA}(T-T_\infty)$

Q. 3 (a) Solve the following tridiagonal matrix using Gauss Elimination & TDMA. Compare the results. 10

$$2.25x_1 - x_2 = 1$$
$$-x_1 + 2.25x_2 - x_3 = 0$$
$$-x_2 + 2.25x_3 - x_4 = 0$$
$$-2x_3 - 2.25x_4 = 0$$

(b) Write Short notes on: 10

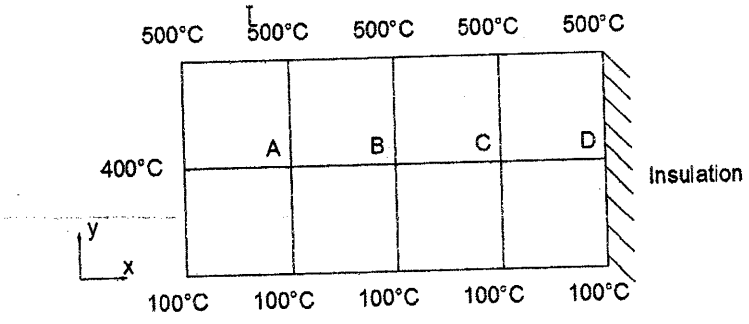
(i) Relaxation methods

(ii) Condition number

Q. 4 (a) Explain Pure Implicit Approach with the help of one dimension unsteady state heat conduction problem. 10

Comment on the stability and accuracy of the implicit approach and give advantages and disadvantages of Implicit approach.

(b) Consider a solid body shown in figure, that is initially at a uniform temperature of 100 °C. For times $t \geq 0$, the boundary temperatures are maintained at the values given in the figure. Derive the Temperature Distribution equation by explicit method. Find the temperatures of the grid points A, B, C and D considering stability criteria after 4 time steps. 10



Q. 5 (a) Explain FOU scheme for convection diffusion problem. 10

State the limitation of FOU scheme and derive the stability criteria for FOU scheme.

(b) Derive unsteady one dimensional convection diffusion equation by Finite Volume Method? 10

Write Short note on Power Law

Q. 6 (a) Explain the stream function Vorticity method. 10

Give the Algorithm for Solution by Stream function-Vorticity Method.

(b) Explain Simple Algorithm 10

State the steps for Simple Algorithm.

Q. 7 (a) Explain why turbulence modelling is required? 10

Give the Classification of Turbulence models

(b) Write short notes on: 10

(a) RSM model

(b) $k-e$ model

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B.Tech. Sem VII Mech. Engg.
Machine Design - II

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam
November 2015

Max. Marks: **100** Duration: **4 Hours**
Class: B.Tech Semester: **VII** Program: **Mechanical Engg.**
Name of the Course: **Machine Design-II** Course Code : **ME401**

- Question No 1 is compulsory.
- Attempt any four questions out of remaining six
- Answers to all sub questions should be grouped together
- Figures to the right indicate full marks
- Use of PSG data books is permitted
- Assume suitable data if necessary

Master file.

Q1. Attempt any **five** questions out of **seven** **(20)**

a) What are the different types of gear tooth failures? State their causes and remedies.

b) Explain how the following factors influence the life of rolling contact bearing:
i)Load; ii) Speed; iii) Temperature; iv) Reliability

c) Explain the desirable properties of the sliding contact bearing materials?

d) What are the factors which limit the suction head of the centrifugal pump and what is the maximum value of height adopted in practice?

e) Explain the significance of the following terms in bearing:
i. Sommerfeld number
ii. Coefficient of friction variable
iii. Flow variable

f) State the assumptions made in the Lewis equation used for design of a gear and explain how these are taken into account during design.

g) Classify the wire ropes based on twisting of wires in a strand and state their specific use.

2. a) A pair of worm gears (20° normal pressure angle) is designated as 1/30/10/8. The input speed of worm shaft is 960 rpm. The worm shaft rotates in only one direction. The worm wheel is made of sand cast bronze with ultimate tensile strength of 400 MPa. The worm is hardened steel (minimum 250 BHN). Determine the maximum input power transmitting capacity based on beam and wear strength. Consider factor of safety as 2.45. **(12)**

Note: $(P_{wheel})_t = (P_{worm})_t \frac{\cos\alpha\cos\gamma - \mu\sin\gamma}{\cos\alpha\sin\gamma + \mu\cos\gamma}$ where $(P_{wheel})_t$ is tangential force on worm wheel, $(P_{worm})_t$ is tangential force on worm screw, α is pressure angle, γ is lead angle and μ is coefficient of friction.

b) Derive the relation for efficiency of worm gears. Explain the term '*back-driving*' in worm gear drive **(06)**

c) i) In three ball bearing identified as : SKF 2015, 3115 and 4215 **(01)**
A) Bore is common but width is increasing
B) Outer diameter is common but bore is increasing
C) Width is common but outer diameter is decreasing
D) Bore is common but outer diameter is decreasing
ii) For above SKF 4215 state manufacture designation **(01)**

3. a) A single-row deep groove ball bearing is used to support the lay shaft of four speed automobile gear box .It is subjected to the following loads in respective speed ratios: **(12)**

Gear	Axial Load(N)	Radial load(N)	% time engaged
First Gear	3150	3900	2
Second Gear	400	2650	5
Third Gear	40	2650	23
Fourth Gear	Nil	Nil	70

b) The lay shaft is fixed to the engine shaft and rotates at 1450 rpm. The static and dynamic load carrying capacities of bearing are 11600 and 17600 N resp. The bearing is expected to be in use for 4200 hrs of operation. Find out the reliability with which the life could be expected.

c) Explain static and dynamic seals with examples.

d) A 20 full depth involute spur pinion of 4 mm module and 21 teeth is to transmit 15 kW at 960 rpm. Its face width is 25 mm. **(06)**

i) The tangential force transmitted (in N) is **(02)**
(A) 3552 (B) 261 1 (C) 1776 (D) 1305

ii) Given that the tooth geometry factor is 0.32 and the combined effect of dynamic load and allied factors intensifying the stress is 1.5; the minimum allowable stress (in MPa) for the gear material is
(A) 242.0 (B) 166.5 (C) 121.0 (D) 74.0

4. a) Derive the Reynolds equation (shown below) for one-dimensional flow of oil in hydrodynamic bearing. State the assumptions made during the derivation. **(10)**

$$\frac{d}{dx}\left(\frac{h^3}{\mu}\frac{dp}{dx}\right) = 6U\frac{dh}{dx}$$

where h is oil film thickness, μ is oil viscosity, p is oil pressure and U is surface velocity of journal shaft.

b) The following data is given for a full Hydrodynamic bearing used in machine tool application. **(08)**

Radial load	25KN
Journal speed	960rpm
Journal Dia	75mm
Class of fit	H7e7
Inlet temperature	40 degree Celsius
Bearing Material	Babbitt

Determine: i) Dimension of bearing ii) min. oil film thickness and select suitable oil for this application

c) Consider the following statements: **(01)**

1. For a radial-translating roller follower, parabolic motion of the follower is very suitable for high speed cams.
2. Pitch point on pitch circle of a cam corresponds to the point of maximum pressure angle.

Which of the statements given above is/are correct?
(A) 1 only (B) 2 only (C) Both 1 and 2 (D) Neither 1 nor 2

d) Consider the following follower motions in respect of a given lift, speed of rotation and angle of stroke of a cam: **(01)**

1. Cycloidal motion 2. Simple harmonic motion 3. Uniform velocity motion.

Which one of the following is the correct sequence of the above in the descending order of maximum velocity?
(A) 3-2-1 (B) 1-2-3 (C) 2-3-1 (D)3-1-2

5. a) In cam mechanism with a flat face translating follower, the total rise of the follower is 45 mm and the cam rotates through 180 degree during the rise period. During the first 90 degree of cam rotation, the follower rises with constant acceleration and it decelerate uniformly during the second half of the rise period. The return of the follower is a SHM during which cam rotates through another 180 degree. **(13)**

(2)

B.Tech. Sem VII Mech Engg.
Machine Design - II. Dt. 16/11/15.

i) If the minimum radius of curvature of the cam profile is not to be less than 42 mm during the rise, determine the min. required radius of the base circle
ii) Find out the min. required width of the follower face with 2.5 mm allowance on each side
iii) What should be the min. amount of offset if the maximum eccentricity of the driving effort during rise is not to exceed 16mm?
iv) Synthesise the fall part of cam profile

b) Classify and explain followers used in cam-follower mechanism **(05)**

c) Match the following **(02)**

List 1	List 2
P- Automobile wheel mounting on axle	1. Magneto bearing
Q- High speed grinding spindle	2. Angular contact bearing
R- I.C. Engine connecting rod	3. Taper roller bearing
S- Leaf spring eye mounting	4. Hydrodynamic bearing
	5. Sintered metal bearing
	6. Teflon/Nylon bush

6. a) A herringbone gear speed reducer consists of 26 teeth pinion driving a 104 teeth gear. The gear have a normal module of 2 mm. The pressure angle is 20degree and the helix angle is 25 degree. The pinion receives 100KW power through its shaft and rotates at 3600 rpm. The face width of each half is 35 mm. The gears are made of alloy steel 30Ni4Cr1 with UTS of 1500 MPa and 450 BHN. The service factor is 1.25. Determine the factor of safety against bending failure and against pitting failure. Decide gear construction. **(12)**

b) Derive Stribecks equation for RCB **(07)**

c) **Assertion (A):** It is desirable to increase the length of arc over which the oil film has to be maintained in a journal bearing. **(01)**
Reason (R): The oil pressure becomes negative in the divergent part and the partial vacuum created will cause air to leak in from the ends of bearing.
(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is not the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

7. a) Draw a neat sketch showing main components of a centrifugal pump. Describe the design method for the following: (i) impeller, (ii) impeller shaft, (iii) volute casing, (iv) wearing ring **(10)**

b) Draw a neat sketch with labels showing main a snatch-block for general purpose hoist. Describe any two component in detail. How you will select rope and write design procedure for it **(10)**

Or

List various types of static seals. State desirable properties of gasket. Write equation for required bolt load with nomenclatures. What are the practical consideration in gasket selection

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Final Year B. Tech. (mech) sem VII
Finite Element Analysis dt. 6.1.16

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SARDAR PATEL COLLEGE OF ENGINEERING

Munshi Nagar, Andheri (West), Mumbai 400 058

(A Government Aided Autonomous Institute)

RE-exam END SEMESTER Jan-2016

Course: ME403 – Finite Element Analysis

Duration: 4 hours | Marks: 100

Class/Branch: Final year B. Tech. (Mechanical) | Semester: VII

Note:

- **Question No 1 is compulsory**
- **Attempt any four questions out of remaining six.**
- Assume suitable data if required and state it clearly.
- Figures to right indicate full marks.
- Answers to all sub-questions should be grouped together.

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Q1. **a)** Define weighted residual technic for solution of differential equations. Explain various WR methods in brief. **05**

b) State and explain iso-parametric element. **05**

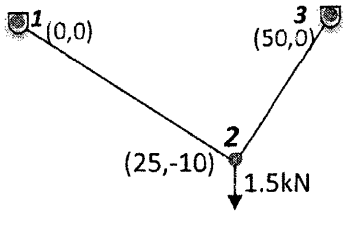
c) State the advantages of FEA over other numerical analysis methods. What are the main steps in FEA? **05**

d) State and explain the properties of stiffness matrix. What is significance of each column in stiffness matrix for 1-D problem? **05**

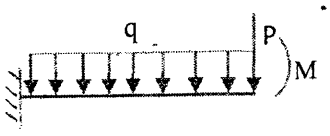
Q2. **a)** For a quadratic bar element obtain the shape functions using Lagrange interpolation function, also derive step-by-step the stiffness matrix and nodal load vector for the same. (use natural co-ordinates) **15**

b) $I = \int\int \frac{3+x^2}{2+y^2}\,dx\,dy$ Evaluate the integral using Gauss quadrature; for 3x3. Determine % error in the result. (exact integral 5.8) **05**

Q3 **a)**



A plane truss is subjected to a downward vertical load at node 2. Determine deflection at node 2 and axial stress in each element. Take for both elements A=50cm^2, E= 200GPa. (Assume co-ordinates in cms) **20**

Q4 **a)** 

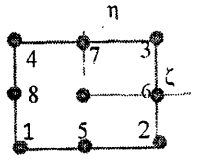
Cantilever beam under transverse load as shown in fig. Using one beam element of length L, obtain the expression for displacement field V(x) over the element. **15**

b) Explain verious types of boundary conditions. **05**

Q5 **a)** A CST element having nodal coordinates (0,0), (4,0), (2,4) for nodes 1,2 and 3 respectively and thickness 2mm; upon loading the nodal deflection (in microns) found to be (2,1), (3,2) and (5,3) at nodes 1,2 and 3 respectively. Determine: i) Displacement at P(2,2); ii) The strain displacement relation matrix; iii) Determine the diagonal elements of the stiffness matrix.(use plane stress element). **20**

Q6 **a)** Explain Jacobian matrix. **04**

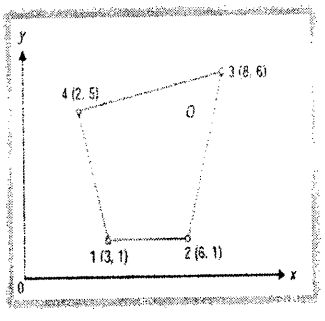
b) Using lagrange concept, find the shape functions for nine noded quadrilateral element as shown in fig., **16**



Q7 **a)** For isoparametric quadrilateral element as shown in adjucent fig.: **10**

i)Determine the local co-ordinates (ζ,η) for point Q having cartesian coordinates (6,5).

ii)Evaluate Jacobian matrix at $(-1/\sqrt{3}, 1/\sqrt{3})$.



b) Explain cholesky factorisation method. **10**

Additional data:

$$[k] = \frac{EI}{L^3}\begin{bmatrix} 12 & 6L & -12 & 6L \\ 6L & 4L^2 & -6L & 2L^2 \\ -12 & -6L & 12 & -6L \\ 6L & 2L^2 & -6L & 4L^2 \end{bmatrix}$$

$$\frac{E}{1-\mu^2}\begin{bmatrix} 1 & \mu & 0 \\ \mu & 1 & 0 \\ 0 & 0 & \frac{1-\mu}{2} \end{bmatrix}$$

$$\frac{E}{(1+\mu)(1-2\mu)}\begin{bmatrix} 1-\mu & \mu & 0 \\ \mu & 1-\mu & 0 \\ 0 & 0 & \frac{1-2\mu}{2} \end{bmatrix}$$

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B.Tech. Sem VII
Renewable energy Sources & Utilization.

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Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam

November 2015

Max. Marks: 100 marks Duration: 3 hours

Class: B.TECH. Semester: VII Program: Mechanical Engineering

Name of the Course: **RENEWABLE ENERGY SOURCES AND UTILIZATION** Course Code : ME-402

Master file.

Instructions:

1. **Question No 1 is compulsory.**
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

		Max Marks
Q1(a)	A PV system designed to supply power to pump water from well, from depth of 45 meter. Solar cell & array consist of 48 modules. Individual cell size is 15.5 x 15.5 cm^2& number of cells per module is 40. Use following data; Energy conversion efficiency of solar cell is 15%, efficiency of pump-motor set is 48 %, efficiency of inverter is 78%, efficiency of battery system is 90%, density of water 1000 kg/m^3. Calculate water discharge rate (m^3/sec) at noon, global radiation incident normally on cell is 966 W/m^2. Also draw block schematic diagram of system indicating efficiency at each stage? Assume suitable data.	8
(b)	What are the main types of OTEC power plant? Describe their working in brief.	8
(c)	A small hydro plant is to be developed on a canal stream where head available is 16.5m and flow is 5.8 m^3/s. assuming the plant efficiency of 85%, find out the power generating capacity at the site.	4
Q2(a)	A multi-bladed windmill is to be designed for running a water pump, which supplies pressurized water at rate of 18 m^3/hour with total lift of 20 meter. The site of installation of windmill has operating conditions as, air pressure is 1.01325 bar& temperature is 30^0C. Wind speed available at site is 30km/hour. Find speed of rotor shaft required for the purpose? Use following data; water density – 1000 kg/ m^3 , water pump efficiency – 40%, efficiency of windmill to pump – 75%, power coefficient- 0.35, speed ratio (λ)-1.05, gas constant (R)- 287 J/kgK. Also draw block schematic diagram of system indicating efficiency at each stage?	10
(b)	Explain performance I-V characteristic & state standard condition of testing solar cell? What are different parameters affect the I-V characteristic of solar cell with figures? Draw schematic diagram of P-V cell testing setup?	6
(c)	Draw the thermal network of it in terms of a) conduction, convection, radiation b) in terms of equivalent resistance and c) simple equivalent circuit. Assume that	4

B.Tech. Mech. Sem VII DT-18/11/15
Renewable energy Sources & Utilization

heat loss from side of collector is negligible.

Q3(a)	Explain following terms related to horizontal axis wind mill; 1) Torque coefficient, 2) Tip speed ratio, 3) Power coefficient, 4)Solidity ratio	6
(b)	Explain relationship between power generated by wind turbine and wind speed with help of proper labelled figure? Derive expression for relation between power coefficient and torque coefficient?	6
(c)	Give classification of biogas plants? Explain continuous & batch type biogas plants?	8
Q4(a)	Describe three method of implementation of DSM. Write benefit of DSM in terms of customer benefit, utility benefits, and social benefits.	7
(b)	What is DSM? Why there is need for DSM? Draw graph showing different type of energy load	7
(c)	Describe different type of renewable energy. Why there is need of renewable energy?	6
Q5(a)	Explain the working principle and construction of instrument that can be seen mounted on the roof of meteorological stations and is placed next to the solar panels used to tap sun's energy. It is used to measure sun's diffused energy.	7
(b)	In a flat plate solar collector, the glass cover upper surface temperature is 60^0c and the absorber plate surface temperature is 100^0c. the convective and radiative heat transfer coefficient from the absorber surface are 3.6W/m^2-k and 1.2 W/m^2-k respectively. The convective and radiative heat transfer coefficients from the glass cover surface to the atmospheric air are 24.5W/m^2-k and 4.35 W/m^2-k respectively. Atmospheric temperature is 30^0C.the glass plate thickness is 5mm and its k=1.05W/m^2-k.find out the heat loss from the absorber plate to the atmospheric air m^2 surface area per hour.	8
(c)	State working principle of Fuel cell with schematic sketch? Explain Polymer electrolyte fuel cell & molten carbonate fuel cell with schematic sketch indicating reaction at anode and cathode elements?	5
Q6(a)	A wind mass having velocity of 20 m/sec, which posses 1 atmospheric at standard pressure and temperature of 300 K. Use given data; Turbine operating speed is 60 rpm, turbine diameter 50 meter, gas constant (R)- 287 J/kgK, consider wind turbine is propeller type & have efficiency of 35%. Calculate- 1) Total power density in wind stream, 2) Maximum obtainable power density, 3) Total power density obtained at output turbine shaft consider efficiency of turbine as 45% 4) Tip speed ratio (λ), 5) Axial thrust force on turbine wheel when it is operating at maximum efficiency. Assume suitable data if required.	10
(b)	Giving line diagram, discuss different type of small hydel power plants.	5
(c)	What are the different factors affecting biogas production & Explain in detail factors among them?	5
Q7(a)	What types of turbines are used in hydro power plant? Describe their characteristic, utility and adoptability.	8
(b)	Explain geothermal energy, classify geothermal sources.	6
(c)	What are the advantages and disadvantages of geothermal energy over other energy forms?	6

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Final year B.Tech. (Mech) Sem VII
Finite Element Analysis.

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Munshi Nagar, Andheri (West), Mumbai 400 058

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END SEMESTER NOV-2015

Course: ME403 – Finite Element Analysis

Duration: 4 hours | Marks: 100

Class/Branch: Final year B. Tech. (Mechanical) | Semester: VII

Note:

- **Question No 1 is compulsory**
- **Attempt any four questions out of remaining six.**
- Assume suitable data if required and state it clearly.
- Figures to right indicate full marks.
- Answers to all sub-questions should be grouped together.

Master file.

Q1. a) Define weighted residual technic for solution of differential equations. Explain various WR methods in brief. **05**

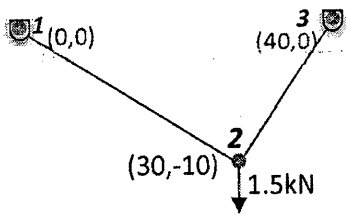
b) What is numerical integration? Explain Gauss-quadrature. **05**

c) State the advantages of FEA over other numerical analysis methods. What are the main steps in FEA? **05**

d) State and explain the properties of stiffness matrix. What is significance of each column in stiffness matrix for 1-D problem? **05**

Q2. a) For a quadratic bar element obtain the shape function using Lagrange interpolation function. Generate the stiffness matrix for the same. Verify that if nodes are uniformly spaced, then Jacobian is $L/2$. **10**

b) $$I = \int\int \frac{3+x^2}{2+y^2}\,dx\,dy$$ Evaluate the integral using Gauss quadrature; for one 1x1, 2x2 and 3x3. Determine % error in each result. **10**

Q3 a) 

A plane truss is subjected to a downward vertical load at node 2. Determine deflection at node 2 and axial stress in each element. Take for both elements A=70cm^2, E= 200GPa. **12**

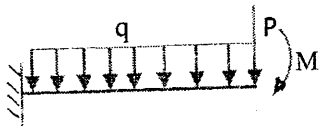
b) For a taper bar c/s area varies linearly from A_0 at the fixed support at x=0 to $A_0/2$ at x=L_T. Calculate the displacement of the end of the bar by modelling the bar in four elements as shown in fig.3b at the end. **8**

(1)

Final year B.Tech. (Mech) Sem VII

Finite Element Analysis Dt. 20/11/15

Q4 **a)** Obtain the stiffness matrix, derive the nodal load vector and calculate slop and deflection at free end; for a cantilever beam of 1meter long subjected to q= 10kN/m, P=100 N, and M= 200N-m (cw). Given E=200GPa and I= $2*10^7$ mm^4. **12**

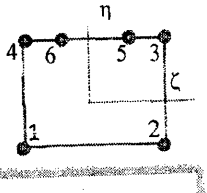


b) Derive the shape functions for beam element. **8**

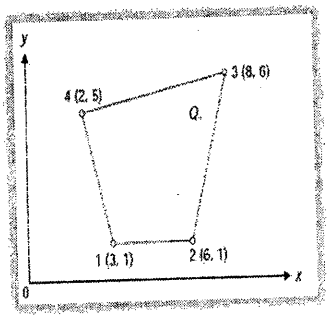
Q5 **a)** A CST element having nodal coordinates (1,1), (3,1), (2,3) for nodes 1,2 and 3 respectively and thickness 2mm; upon loading the nodal deflection (in microns) found to be (2,1), (3,2) and (5,3) at nodes 1,2 and 3 respectively. Determine: i) Displacement at P(2,2); ii) The strain displacement relation matrix; iii) The strains ε_x, ε_y and γ_{xy}. iv) The element stresses (plain strain). **20**

Q6 **a)** Derive consistant nodal load vector for vertically hanging quadratic bar element. Take the load as body force due to gravity, expressed as q= ρAg. **8**

b) Using serendipity concept, find the shape function for the element shown in fig., having co-ordinates (1/3,1) and (-1/3,1) for nodes 5 and 6 respectively. **12**



Q7 **a)** For isoparametric quadrilateral element as shown in adjucent fig.:
i)Determine the local co-ordinates (ζ,η) for point Q having cartesian coordinates (7,4).
ii)Evaluate Jacobian matrix at $(1/\sqrt{3}, 1/\sqrt{3})$. **10**



b) Explain different types of Boundary Conditions. **5**

c) What are the advantages of Weak-form method? Compare this method with the Non-weak form methods. **5**

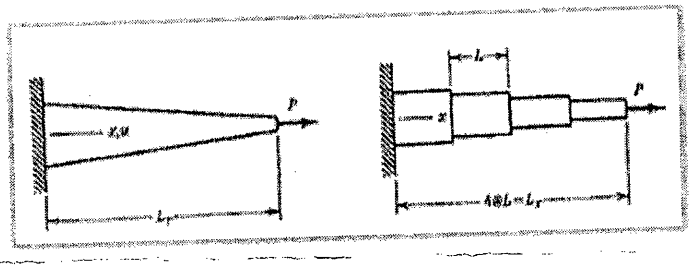


Figure 3b)

Additional data:

$$[k] = \frac{EI}{L^3}\begin{bmatrix} 12 & 6L & -12 & 6L \\ 6L & 4L^2 & -6L & 2L^2 \\ -12 & -6L & 12 & -6L \\ 6L & 2L^2 & -6L & 4L^2 \end{bmatrix}$$

$$\frac{E}{1-\mu^2}\begin{bmatrix} 1 & \mu & 0 \\ \mu & 1 & 0 \\ 0 & 0 & \frac{1-\mu}{2} \end{bmatrix}$$

$$\frac{E}{(1+\mu)(1-2\mu)}\begin{bmatrix} 1-\mu & \mu & 0 \\ \mu & 1-\mu & 0 \\ 0 & 0 & \frac{1-2\mu}{2} \end{bmatrix}$$

(2)

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B.Tech.(Mech) Sem VII
Industrial Engg. & Project Management.

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam

November 2015

Max. Marks:**100** Duration: **3hrs**

Class: **B.Tech.** Semester:**VII** Program: Mechanical Engineering

Name of the Course: **IEPM** Course Code : **ME404**

Instructions:

1. **Question No 1 is compulsory.**
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary
5. Use of ND table permitted.

Master File.

Question No		Maximum Marks
Q1(a)	What do you mean by Project Integration management? What are the Project Knowledge Areas? What precautions are to be taken in Project Integration management? Explore the success factors Managing the projects in Global Environment.	10
Q1(b)	The following information regarding the output produced and inputs consumed for the particular time for a particular company are given below. • Output=10000Rs. • Human Input=3000Rs. • Material Input=200 Rs. • Capital Input =300Rs. • Energy Input=100Rs. • Other Miscellaneous Input=50Rs. • Compute various productivity indices. Suggest the actions to be taken for improving these productivity indices.	10
Q2(a)	You are the Chief Project Manager of the Project involving Designing, Developing, Planning, manufacturing and Launching a New Industrial washer by a Industrial washer manufacturing company. It company decides to produce the product it must either install a new division which needs a cash outlay of Four lakhs rupees, or work overtime expenses of Rs 1.5 lakhs. If the company decides to install a new division , it needs an approval from Government and there is a 70% chance of getting the approval [i.e. 30% risk of Non Approval]. The market survey has revealed the following facts regarding magnitude of sales based on Risks.	10

Magnitude of sales	Probability	Results Profit [in Rs Lakhs]
High	0.45	15
Medium	0.30	7
Low	0.20	3
Nil	0.05	-5

However by resorting to overtime the company will not be in position to meet

the high magnitude of sales. It will be able to satisfy up to the level of medium magnitude only, even if magnitude of sales results.
Required: Solve the problem to suggest which option should be selected?

Q2(b) The optimistic, most likely and pessimistic times of the activities of a project are given below. Draw the project network. Find the variance and expected completion of time. 10

Predecessor Event i [For Activity i-j]	Successor Event j [For Activity i-j]	t_o	t_m	t_p
10	20	6	9	12
10	50	4	7	8
20	30	14	17	20
20	40	7	10	13
20	50	3	5	9
30	70	13	18	25
40	60	10	14	16
40	70	12	15	18
50	60	9	11	12
60	70	17	20	25

Q3(a) The following data refers to the workstudy for a manufacturing of a product. The elemental timings are given below along with the respective ratings. Assume rest and personal allowance as 12% and contingency allowance of 2% calculate the standard time for the operation. If there is compulsory 1/2 hour of load shedding in shift of 8 hrs, compute no of products to be produced in a shift. 10

Elements	Observed Time	Rating	Remark
A	0.2	90	-
B	0.05	80	-
C	0.03	100	-
D	0.78	100	-
E	0.06	100	-
F	0.05	100	-
G	0.02	85	Once in 5 pieces
H	0.06	80	-
I	0.10	90	-
J	0.04	90	Once in 20 pieces

(2)

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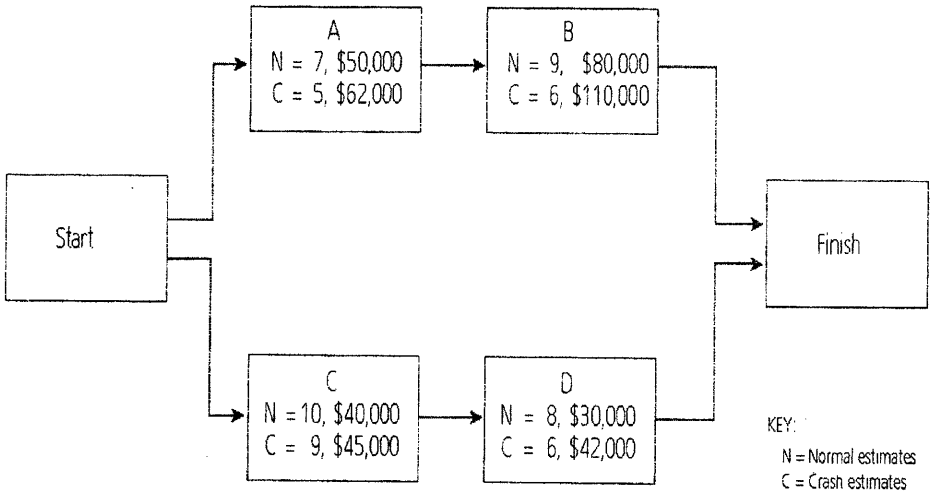
Industrial Engg. & project mgmt.

Q3(b) Refer the following Project network. N and C are normal and Crash Time respectively. The Corresponding costs are also given in each box. Crash the Project, Compute the Final Cost of the project and Duration. State the rules for crashing the project. 10

FIGURE 7.7 Network with Normal and Crash Times and Their Costs



Q4(a) The time estimate [in weeks] for the activities of PERT network are given below. 10

Activity	t_o	t_m	t_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Draw the project network.
Show the Critical path
Determine the Project Duration.
Show the variance of the project length
Calculate the probability that the project will be completed in at least 4 weeks earlier than expected time.

Q4(b) Rahul Enterprises is an established brand in Wind turbine Manufacturing. The company has decided to design develop and launch a New Wind turbine with higher rating. Explain Project Procurement Manager's Responsibility and skills needed in detail. 10

Q5(a) Amey has decided to launch the one the Biggest Air line services with 1000 airbuses operating across the world. He will be using the strategy of Merger and Acquisition for this. Who will be the stakeholders for his project? What will be their requirements? How will you carry out stakeholder analysis?What will be your strategy to deal with these stakeholders? 10

(3)

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Q5(b)	Akash Engineering Corporation manufactures the Heat Exchangers. You have joined this organization recently as a Chief Quality Manager. The company received a Project titled "Design and Development of Heat Exchanger" The company records shows that there are multiple rejections, more rework in fabrication process. As a result the company missed the deadlines and there are huge rework cost. Explain in detail how will you perform? What will be your strategy? What tools will you use and how will you use them?	10
Q6(a)	Explain Ergonomic Consideration with suitable examples. Draw the appropriate diagrams.	10
Q6(b)	Explain the Supply Chain Risks with suitable example. Comment on Supply chain visibility, Supplier selection, Process, management, labour, Demand.	10
Q7(a)	Akshay Engineering corporation is an established brand in sheet metal working. The company has decided to expand the business by establishing new unit at Vapi. Prepare Project Communication Management plan with atleast 10 relevant entries.	10
Q7(b)	What do you mean by EVM in project management? State the important terms, Illustrate them with suitable figure and example.	10

*****

Best of Luck !!!

4

B.Tech. (Mech) Sem VII Dt. 23/11/15.

Industrial Engg. & project Mgmt.

Standard Normal Probabilities

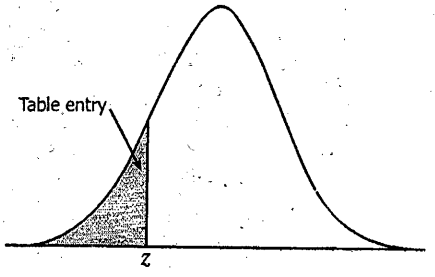

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

B.Tech. (Mech) Sem VII Dt. 23/11/15

Industrial Engg. & project Mgmt.

Standard Normal Probabilities

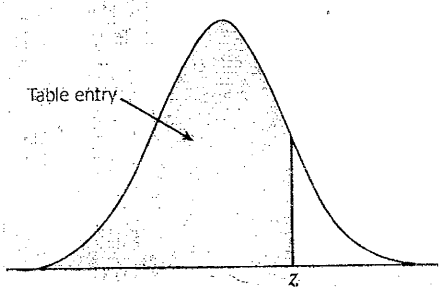

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

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B.Tech. Mech. sem VII

Business process Reengineering & total Quality Mgmt.

BHARATIYA VIDYA BHAVAN'S

SARDAR PATEL COLLEGE OF ENGINEERING

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam

November 2015

Maximum Marks: 100 **Duration: 3 Hrs**

Class: **B. Tech. (Mechanical)** Semester: **VII**

Program: **B. Tech. (Mechanical Engineering)**

Name of the Course: **Business Process Reengineering and Total Quality Management**

Course Code: **ME407**

Instructions:

1. **Question No 1 is compulsory.**
2. **Attempt any four questions out of remaining six.**
3. **Draw neat diagrams**
4. **Assume suitable data if necessary**

Master file

Question No.		Max. Marks
1. (a)	Discuss philosophy of BPR and explain with illustrations the words 'fundamental', 'radical', 'redesign', 'process', and 'dramatic' included in the definition.	(10)
(b)	Explain Deming Philosophy & Crossby's philosophy in detail	(10)
2. (a)	Explain common myths associated with BPR.	(10)
(b)	Discuss the common pitfalls in BPR?	(10)
3 (a)	Explain the role of Information Technology in BPR? Explain BPR case study representing the significant role of IT.	(10)
(b)	Write a note on BPR implementation in Indian post service: Synthesize present scenario and present your creative suggestion	(10)
4 (a)	Explain steps in implementation of ISO 9000 Quality management system	(10)
(b)	Explain central concept of ERP. Discuss the benefits of implementation of ERP in an organization. Distinguish between ERP and BPR.	(10)
5 (a)	Describe FMEA with case study	(10)
(b)	Explain OEE. Calculate OEE for 1 shift 8Hrs, short breaks 2@ 15 min, Meal break 1@30 min, Down Time 47 min, Ideal Run time 60 pieces per min, Total pieces 19271, Reject pieces 423.	(10)
6 (a)	Explain House of Quality with Suitable Case Study	(10)
(b)	Explain seven tools of quality with examples of each	(10)
7 (a)	Explain measures of central tendency, dispersion, population and samples with suitable examples	(10)
(b)	Describe the Control Charts variables and attributes in detail	(10)

(1)

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04-01-16

B.Tech. Sem VIII (Mech)
Design of Mechanical systems.

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

KT-Examination
January 2016

Max. Marks: **100** Duration: **4 Hour**
Class: **B.Tech.** Semester: **VIII** Program: **B.Tech. in Mechanical Engineering**
Name of the Course: **Design of Mechanical Systems** Course Code: **ME451**

Instructions: Master file.

1. Attempt any five questions.
2. Answers to all sub questions should be grouped together.
3. Figures to the right indicate full marks.
4. Use of PSG data book is permitted.
5. Assume suitable data if necessary

Q1 a) How do you differentiate the design of mechanical systems from that of machine elements? Explain the system design approach with an example of any mechanical system. **(4)**

b) Explain the role of following components of a belt conveyor system: (i) idlers, (ii) take-up or belt tensioning devices and (iii) belt cleaners. **(4)**

c) Compare between centrifugal and positive displacement pumps. **(4)**

d) Write a short note on internal gear pumps and compare them with external gear pumps. **(4)**

e) Define following terms and mention their significance in the design of pressure vessels: (i) design pressure, (ii) joint efficiency, (iii) MDMT, (iv) corrosion allowance. **(4)**

Q2 a) Following specification refer to an EOT crane. **(15)**

- Class of mechanism = M7 (equivalent to old-standard class III)
- Hook load = 85 kN
- Height to which load is raised = 10 m
- Dead weight of hoisting system = 4 kN
- Braking time for hoist = 2 seconds
- Hoisting velocity = 14 m/min
- Number of rope falls = 4
- Efficiency of pulley system = 0.94
- Weight of trolley = 9 kN
- Speed of trolley = 22 m/min
- Trolley wheel and wheel-axle diameters = 250 and 60 mm

(i) Select suitable size of rope.
(ii) Design rope drum.
(iii) Calculate power rating of electric motor to drive trolley

b) How axial thrust is balanced in centrifugal pumps? **(5)**

Q3 a) Give general classification of material handling systems. Under each classification type, list the names of related systems. **(5)**

(1)

B.Tech. (Mech) Sem VIII
Design of Mechanical Systems. Dt. 04/01/16.

b) Design a 20° troughing belt conveyor to transfer 160 tons/hour of iron ore through a horizontal distance of 100 m and vertical height of 20 m. The belt speed is to be limited to 2.6 m/s. Secondary resistance for belt wrapping around pulley (R_w) can be taken as 400 N (total). Assume suitable coefficient of rolling friction between idler and belt, friction factor between belt and pulley and the angle of belt wrap around pulley. Design should include following. **(15)**

(i) Belt width.
(ii) Calculation of belt resistances and belt-tension.
(iii) Selection of belt fabric.

Q4 a) A centrifugal pump is to be designed to generate total head of 60 meters; the medium is water at 20°C and discharge rate is 100 m^3/hr. The pump is directly coupled to an electric motor. Determine power requirement and select suitable motor for the pump. Calculate the suction pipe diameter, impeller dimensions and number of vanes. **(15)**

b) What is significance of nozzle reinforcement calculations in pressure vessel design? Explain the design procedure to calculate reinforcement requirement for nozzle connection in pressure vessels. **(5)**

Q5 a) Write a short note on design of structural parts of trolley and bridge for EOT crane. How will you optimize the weight of beams for the bridge? **(5)**

b) Design a gear pump to deliver automotive grade oil at discharge rate of 185 liters/minute. The delivery pressure is 35 bar. The pump is directly connected to an electric motor. The design calculations should include: gear size, suction and discharge pipe size, shaft diameter, casing thickness and power rating of electric motor. **(15)**

Q6 a) A vertical process column of welded construction has following design specification. **(15)**

Inside diameter = 2000 mm	Material = Carbon steel
Straight length of shell = 24,000 mm	Liquid level = 9,000 mm from bottom head to shell weld joint
Type of heads = Hemispherical	Liquid specific gravity = 1.20
Design internal pressure = 2.5 MPa	Allowable stress = 140 MPa
Design temperature = 145° C	Corrosion allowance = 3 mm
Joint efficiency = 0.70	Hydrotest pressure = nil

Calculate: (i) Thickness of shell and top/bottom heads, (ii) Pressure-temperature rating class of flanges fitted on the vessel and (iii) suitable schedule for 600 mm nominal diameter nozzle pipe for the vessel.

b) Derive expression for conveyor belt capacity in tons/hour in terms of belt width for both flat and troughed belt. **(5)**

Q7 a) Describe types of loadings to be considered in design of EOT crane. **(5)**

b) Driving motor for trolley of an EOT crane in a workshop is frequently getting tripped due to overload. The shop supervisor confirms that lifting load is always below SWL of the crane and suspects design mistake in selection of motor capacity. Your task is to investigate the power requirement of trolley system. Write relevant design equations/parameters and highlight possible assumptions/decisions which could have gone wrong in trolley system design. **(5)**

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Design of Mechanical Systems. Dt. 04/01/16.

c) Describe with neat sketches different types of wearing rings used in centrifugal pump. (5)

d) Explain with sketch the working of diaphragm pump. (5)

Annexure 1

(All symbols indicate their conventional meaning)

Impact factor for structural components of EOT crane (IS 3177)

Class	M1	M2	M3	M4	M5	M6	M7	M8
Impact factor	1.06	1.12	1.18	1.25	1.32	1.40	1.50	1.50

Standard diameters of rope drum at the bottom of groove: 200, 250, 315, 400, 500, 630, 710, 800, 900, 1000, 1250 mm.

Some useful relationships for design of centrifugal pump:

Suction pipe diameter, $D_s = \sqrt{\frac{4Q'}{\pi V_s} + {d_n}^2}$

where $Q' = (\text{leakage factor}) \times Q$, $V_s = V_0 = V\epsilon$, $V = \sqrt{2gH}$,

$\epsilon = 0.023\sqrt{n_q}$

Inlet vane width, $b_1 = \frac{Q'}{\pi D_1 V_0}$

Outlet vane width, $b_2 = \frac{Q'}{\pi D_2 V_{m3}}$ where $V_{m3} = (0.8\ to\ 0.9) \times V_0$

Number of vanes, $z = 13\frac{r_m}{e}\sin\beta_m$

$\tan\beta_1 = \frac{1.25V_0}{u_1}$, $u_1 = \frac{\pi n D_1}{60}$

Design relationships for design of pressure vessels

Design wind pressure in $N/m^2 = 0.613V^2$, where V is wind velocity in m/s.

Pressure temperature rating class for flanges (Carbon steel)

	Working Pressure by Classes, bar						
Class Temp., °C	150	300	400	600	900	1500	2500
-29 to 38	19.8	51.7	68.9	103.4	155.1	258.6	430.9
50	19.5	51.7	68.9	103.4	155.1	258.6	430.9
100	17.7	51.5	68.7	103.0	154.6	257.6	429.4
150	15.8	50.2	66.8	100.3	150.5	250.8	418.1

Pipe schedule

NPS inches	N.D.	O.D. mm	10	20	30	STD	40	60	XS	80	100	120	140	160	XXS
22	550	558.8	6.35	9.53	12.70	9.52	15.87	22.22	12.7	28.57	34.92	41.27	47.62	53.97	-
24	600	609.6	6.35	9.53	12.70	9.52	17.47	24.61	12.7	30.96	38.89	46.02	52.37	59.54	-
26	650	660.4	7.92	12.70	-	9.52	-	-	12.7	-	-	-	-	-	-

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Lib – Re-Exam
05-01-16

B.Tech. (Mech) Sem VII Dt. 05/01/16.
Renewable Energy Sources & Utilization.

BharatiyaVidyaBhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Re-Exam
January 2016

Max. Marks: 100 marksDuration: 3 hours
Class:B.TECH. Semester: VII Program: Mechanical Engineering
Name of the Course:**RENEWABLE ENERGY SOURCES AND UTILIZATION**
Course Code : ME-402

Instructions:

Master file.

1. **Question No 1 is compulsory.**
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

		Max Marks
Q1(a)	A wind mass having velocity of 25 m/sec, which posses 1 atmospheric at standard pressure and temperature of 303 K. Use given data; Turbine operating speed is 50 rpm, turbine diameter 45 meter, gas constant (R)- 287 J/kgK, consider wind turbine is propeller type & have efficiency of 45%. Calculate- 1) Total power density in wind stream, 2) Maximum obtainable power density, 3) Total power density obtained at output turbine shaft consider efficiency of turbine as 45% 4) Tip speed ratio (λ), 5) Axial thrust force on turbine wheel when it is operating at maximum efficiency. Assume suitable data if required.	**10**
(b)	What types of turbines are used in hydro power plant? Describe their characteristic, utility and adoptability.	**8**
(c)	A small hydro plant is to be developed on a canal stream where head available is 25.5m and flow is 9.6 m^3/s. assuming the plant efficiency of 70%, find out the power generating capacity at the site.	**2**
Q2(a)	A multi-bladed windmili is to be designed for running a water pump, which supplies pressurized water at rate of 20 m^3/hour with total lift of 16 meter. The site of installation of windmill has operating conditions as, air pressure is 1.01325 bar& temperature is 27^0C. Wind speed available at site is 25 km/hour. Find speed of rotor shaft required for the purpose? Use following data; water density – 1000 kg/ m^3 , water pump efficiency – 45%, efficiency of windmill to pump – 85%, power coefficient- 0.40, speed ratio (λ)-1.11, gas constant (R)- 287 J/kgK. Also draw block schematic diagram of system indicating efficiency at each stage?	**10**
(b)	Describe different type of renewable energy. Why there is need of renewable energy?	**6**
(c)	Write in brief different site selection criteria for installation of wind mill?	**4**

B.Tech. (Mech) Sem VII. Dt. 05/01/16.

Renewable Energy sources & Utilization.

Q3(a)	Give an outline of energy reserves of India and world?	6
(b)	Explain relationship between power generated by wind turbine and wind speed with help of proper labelled figure? Derive expression for relation between power coefficient and torque coefficient?	6
(c)	Give classification of biogas plants? Explain continuous type biogas plants?	8
Q4(a)	There are two power generating station one produced 1500MW electricity and second produced 800MW electricity. Industry required electricity of 2000MW in working hours during 8am to 7pm. But power station also distributes electricity to other consumers. Then discuss in detail how power stations manage to distribute electricity to industry and other consumer.	7
(b)	What is DSM? Why there is need for DSM? Define a] Air mass b] Extraterrestrial and terrestrial solar radiation?	7
(c)	Explain solar cell working principle and energy band theory along with schematic sketches? Also explain solar cell characteristic with I-V curve?	6
Q5(a)	Explain the working principle and construction of instrument that can be seen mounted on the roof of meteorological stations and is placed next to the solar panels used to tap sun's energy. It is used to measure sun's diffused energy.	7
(b)	In a flat plate solar collector, the glass cover upper surface temperature is 60^0c and the absorber plate surface temperature is 100^0c. the convective and radiative heat transfer coefficient from the absorber surface are 3.6W/m^2-k and 1.2 W/m^2-k respectively. The convective and radiative heat transfer coefficients from the glass cover surface to the atmospheric air are 24.5W/m^2-k and 4.35 W/m^2-k respectively. Atmospheric temperature is 30^0C.the glass plate thickness is 5mm and its k=1.05W/m^2-k.find out the heat loss from the absorber plate to the atmospheric air m^2 surface area per hour.	8
(c)	State working principle of Fuel cell with schematic sketch? Explain Polymer electrolyte fuel cell & Phosphoric Acid Fuel Cells with schematic sketch indicating reaction at anode and cathode elements?	5
Q6(a)	A commercial park requires 1400 W power for 4 hours during night time. A system of photovoltaic array, battery storage system, and inverter is used. This solar power supply system designed such that, it can meet two extra nights power requirement even if there has been no sunshine during that day's. Given data: Solar radiations are available for an average of 6.5 hours daily & average hourly global radiation flux incident on array 700 W/m^2. Battery rating – 12V, 120Ah. Battery charging and discharging efficiency = 0.8, depth of discharge = 0.7. Inverter efficiency at full load = 80%. Module size is 119.1 cm and 53.3 cm and its conversion efficiency 15%. Calculate – i) Number of photovoltaic modules needed ii) Number of batteries required for above requirement. iii) Draw schematic block diagram of system showing system components in sequence	10
(b)	Giving line diagram, discuss different type of small hydel power plants.	5
(c)	What are the different factors affecting biogas production & Explain in detail factors among them?	5

Q7(a)	What are the main types of OTEC power plant? Describe their working in brief?	8
(b)	Explain geothermal energy, classify geothermal sources.	6
(c)	What are the advantages and disadvantages of geothermal energy over other energy forms?	6

B.Tech. (Mech) sem VII
Renewable Energy Sources.

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.

KT Exam

7th Jan 2016

Max. Marks: 100 Duration: 3hrs
Class: B.Tech Semester: VII Program: B.Tech
Name of the Course: **Renewable Energy Sources** Course Code : EE404

Instructions:

1. **Question No 1 is compulsory.**
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Master file.

Question No		Maximum Marks
Q1	Explain any **two** of the following	20
(a)	Solar thermal collectors for heating	
(b)	Scope, economies & availability of Wave & tidal energy	
(c)	Solar tracking systems	
Q2(a)	What are the two main problems caused by cell mismatch and its effect in a PV module and how are these effects minimized.	10
(b)	A propeller-type wind turbine has the following data: Speed of free wind speed at height of 12m = 14m/s; $\alpha = 0.15$; Air density = 1.24 kg/ m^3; height of tower = 100m; rotor diameter = 85m; generator efficiency = 85%; wind velocity at the turbine reduces by 20%. Find (i) Total power available in the wind (ii) Power extracted by the turbine (iii) Electrical power generated. (Mention the representation of notations used).	10
Q3(a)	Suggest an energy conversion technology and give its operation to derive electricity from the following (one for each) (i) Ocean thermal energy (ii) Wave energy (iii) Tidal energy	12
(b)	Narrate a technology for economic production of electricity from geothermal resources lower than 150 ° C (302 ° F).	8
Q4(a)	Explain Combined Flash and Binary Geothermal power plant	10
(b)	Latent heat storage system	10
Q5(a)	Explain Horizontal and vertical axis wind mill	10
(b)	Biogas plant with floating dome.	10
Q6(a)	Explain Solar radiation measurements.	10
(b)	Explain Earth – Sun angles & Observer – Sun angles	10
Q7	Explain any **two** from the following	20
(a)	Principle of operation of photovoltaic cell.	
(b)	Measurement of solar beam radiations using Pyrheliometer	
(c)	Electricity generation in a solar thermal plant-large scale systems.	